The
Electrical Review

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Principal Contents:

	PAGE
A Call for More Information	209
All-Electric Flats in London	212
The Year's Radio Progress. By E. H. W. Banner	213
Electrostatic Precipitators. By C. C. Downie	215
The Woman Demonstrator. By Mabel G. Reading	216
Mercury Switches	217
The Electrolytic Production of Hydrogen	218
The Cossor Works at Highbury	219
Glass Bulb Rectifiers	220
Correspondence: Round or Flat Plugs; Advice to Intending Engineers; The Rateable Value Charge; Industrial Switchgear	221
Lock Electrification in France	223
New Apparatus and Devices	224
New Books	226
Business and Industrial Notes	227
Electricity Supply	230
Traction	231
Communications	232
Contract Information	233
Notes	234
Our Personal Column	235
New Companies Registered	236
Returns of Electrical Companies	237
City Notes	237
Stocks and Shares	237
Published Specifications	239
New Work for Contractors	240

A Call for More Information

SOMETHING should be done to make our statistics regarding the increasing generation and consumption of electricity more informative.

They could be so amplified as to be of greater practical value for electrical trade purposes generally; the newspaper journalist would be able to make better use of them if the dry bones were covered with flesh; and the man in the street would periodically learn how and why electricity was advancing.

As things stand at present the Electricity Commissioners issue statements to the Press showing the total kWh generated in a past month for this year and last, also comparative figures for the two years down to date. The percentage advances for both periods are indicated, but it is impossible for the average electrical student of affairs to arrive, save by the purest guesswork, at any understanding of what the figures mean by way of indication of definite electrical advance in any particular direction or district.

It is with electricity supply statistics very much as it is with our monthly trade returns; such matters require more or less expert knowledge of these particular subjects if we are to be equipped to understand for ourselves, and to show to others for their practical use, what factors have been at work producing either an increase or a decrease in output and consumption.

While everybody cannot be an expert, we can at least obtain a good deal of useful information from official records. We can both tell what has been happening and, in certain cases, be able to judge the probabilities in certain areas or trades.

These monthly outline electricity statistics have been used by newspaper writers to lead investors to think in ways which, to put it mildly, are not justified by the official figures alone. For example, city editors who make the publication of the month's advance the basis for favourable comment regarding one or two selected company securities know no better than we do ourselves from the figures whether the advance recorded has been made by municipal undertakings or by companies; they certainly cannot tell that it has occurred on the system of the company whose merits they discuss unless they have been informed from some interested source.

If some information could be given showing which areas or which industries had been responsible for the better business, or whether some change-over of railway load or the opening of a new section of line was a contributing influence, the public would be brought more closely into touch with reality.

The figures, as collected from the different authorities, are, of course, in the possession of the Commissioners, and it should be quite a small matter for the staff to indicate in a few sentences, circulated with the output and percentage statement, the nature of the development that is responsible for the improvement—or for the decline if anything so unthought of should occur. Intimation that there was an all-round advance throughout Britain would be better than nothing.

The point raised above possesses an added interest at the present time when the new E.D.A. movement is about to begin. One result of that enlarged and more active organisation might well be livelier publicity proceedings regarding the doings of both the Commissioners and the Central Board. Doubtless such an arrangement will be facilitated by the Board's substantial representation on the new Council.

The American Electrical Code

THE code drawn up by the National Electrical Manufacturers' Association (ELECTRICAL REVIEW, August 11th, p. 194) has been revised in order to meet the criticisms offered by conflicting interests. In the form in which it was sent forward to Administrator Johnson, and ultimately to President Roosevelt for approval, the exemption of vacuum-cleaner, radio, washing-machine and certain other classes of manufacturers is provided for; these may, if they so elect, and if the Administrator approves, prepare their own codes. "Commission Salespeople" as they are

described (*Electrical World*) are excepted from minimum wage proposals, and the settling of wage rates according to population is abandoned. The minimum wage rate of 35 cents for labour has been increased to 40 cents, while that for other employés, except commission salespeople, is raised from $14 to $15 per week. The specified excess hours of labour permissible where peak or seasonal demand for products is concerned have given place to a provision that such hours may be worked as necessity requires. There are other alterations as well, but those mentioned indicate roughly that concessions and compromises have had to be agreed upon in order that the President's proposals can be even practically considered. The same sort of thing is happening in many other industries, for the interlacing of trade and industry with difficult and irregular relationships is not peculiar to electrical interests in America any more than it is here.

Heavy Weather

OUR New York electrical contemporary says that the "new deal" is making heavy weather. Propaganda efforts urging discrimination against non-co-operating concerns have been followed this week by a threat that they will not be allowed to share in the big public works contracts. There is a disposition on the part of some industries, though working to code, to restrict new products and designs, selling only established lines. Unwillingness on the part of public utility concerns to "come in" has developed into an arrangement for electric light and power and telephone undertakings to substitute their own codes for the President's agreement. One report states that the trade improvement which had already begun before codes were talked about has eased off and been replaced by an abnormal or artificially promoted business. To students of electrical affairs, the interesting question is whether the electrical and other trades which have tried for many years to reach voluntary practical working arrangements at their leisure will be compelled by the trade recovery bombshell to reach settlements of their differences in a hurry.

Holidays and Hotels

"WHAT! A gas fire and meter and a gas ring! And no light beside the bed!" The words of an electrical man to the manageress of a hotel at a seaside resort in this summer of 1933! Reply: "Yes! I keep on urging my directors but they don't do anything about it." The holiday season has once more brought into prominence the failure of many hotels and boarding houses to provide reasonable electrical facilities for holiday-makers. Where is their business sense in making us long for the comfort of our own homes? When E.D.A.'s hotel propaganda effort was in progress everybody electrical was advised by one of our correspondents to leave a protest behind as he paid his bill. Readers should rub it in this year—indeed, in desperation one is tempted to urge the preparation of a black list.

Demonstrators

IN our "Correspondence" columns recently the question whether electrical demonstrators should be men or women was discussed. We are not sure that the arguments in favour of each sex were not about balanced, but perhaps Miss Reading's article in this issue will tip the scale in the ladies' favour. The authoress sets out the necessary qualifications for a successful demonstrator, many of which, we think, are eminently feminine. Then, again, women are likely to possess a greater appreciation of the domestic consumer's point of view, which is a great asset in this form of salesmanship. On the other hand, some women are more likely to listen to a man demonstrator than to a woman, who, they may feel, cannot possibly have such a grasp of things electrical. However, only results can give any sort of guidance as to the ultimate truth of the matter. But let us warn the aspirant to an electrical demonstratorship—whether male or female—to beware of one terrible fault which we believe to be fairly common. Don't learn your sales speeches by heart and deliver them with the air of a child reciting a multiplication table. Above all things, show understanding of the subjects with which you are dealing; forget watts and amperes and talk in £ s. d., a measure which the customer will understand.

A Welding Era

DURING the past two or three years rapid developments in electric welding have taken place in all countries. From the general report of the recent Sectional Meeting of the World Power Conference we gather that about 10,000 welding sets are now in use in Germany, requiring a ton of electrodes per set and consuming upwards of 50 million kWh per annum. These are more definite figures than we have for Great Britain, but many articles in our columns have given indications of remarkable progress in this sphere. The trend towards higher speeds has been assisted by the development of automatic welding heads; the same tendency calls for the use of thick electrodes and heavier currents. It has been found that a careful choice of covering material enables the requisite mechanical strength and durability to be obtained on a.c. circuits with cheap coated electrodes, the production of which is encouraged by the change-over of distribution networks. There is every evidence that in the near future there will be even more intensive developments in electric welding.

A Curious Combination

WE do not think that a showroom, any more than a man, can satisfactorily serve two masters, although it has been tried more than once. The latest instance is at Colwyn Bay, where a joint electricity and gas showroom has been opened by the Corporation, which provides both services. The gas undertaking of the town, like those of other places, was first in the field, and has a greater hold, and as there is to be no "cut-throat" competition between the two departments we can well imagine that where a gas main already exists there will be reluctance to lay an electric cable as well. There was a time when it was thought that each of the two services had its own particular field, but now we decline to restrict ourselves to what the gas interests think is right for us. The two services, if not antagonistic, are unsuitable bedfellows, and we prefer that electricity should remain unfettered to continue that progress which so alarms our rivals.

Diversity Factor

BEFORE the supply of electricity for domestic purposes came to account for so considerable a proportion of the electricity sold diversity of demand was regarded in a somewhat casual way. In working out the economics of a new supply connection, except in the few cases of definitely off-peak loads, it was often looked upon as merely a reserve for contingencies. Load factor was the accepted criterion, and it has been an obstacle to progress that the same yard-stick has been applied to the later-coming domestic load. Fortunately, there were those who realised the very great importance in that sphere of the differing times of the domestic demand—on the power-station, on the substations, and at individual consumers' terminals. Engineers who have been among the foremost in developing the domestic load assure us, after a careful study of all the records they have been able to obtain from their own and other undertakings, that they have worked out their schemes on the basis of diversity factor, and that their success depends upon the correctness of their conclusions on this point. If the peak caused by lighting is covered in the tariff, the rest—at competitive running charges—will look after itself. They have had the courage to back their faith by works, and we believe that their policy will be fully justified.

All-electric Flats (See next page)

1, 3 and 5. Living room, kitchen and bathroom at Middleton House, Westminster. 2, 7 and 8. Kitchen, living room and exterior, Darryngton House, Lambeth. 4. Exterior view of flats at Westminster. 6. Transforming station on the Fauxhall Manor Estate.

All-electric Flats in London

WE have during the past few days had an opportunity of inspecting two excellent examples of what can be done in the way of electrifying residences of the cheaper type in London. These are Daryngton House, Lambeth, and Middleton House, Westminster, and illustrations of the leading electrical features appear on the preceding page.

Daryngton House is a new building comprising sixteen self-contained working-class flats on the Fauxhall Manor Estate of the Ecclesiastical Commissioners, the existing houses on which are being demolished to make room for similar modern residences and shops. The South London Electric Supply Corporation was already providing electricity for general purposes

Service connections, including the special junction box, in one of the Daryngton House flats

to eight houses (which included ten flats over shops) in Davidson Gardens on the estate. When the construction of Daryngton House was projected the company was entrusted with the work of making them "all electric"; this work covered the wiring by the company's own staff and the supply of all apparatus. The Ecclesiastical Commissioners include all standing charges in the rent. If the scheme proves successful, as is confidently anticipated, the remainder of the 160 flats on the Fauxhall Manor Estate will no doubt be all-electric also.

The consumption of electricity by the tenants in Daryngton House for the first four months after the start of the supply in February averaged 600 kWh per flat. It is estimated that the maximum demand of the whole estate will be about 1,000 kW. In each room is a power-plug point, so that the portable electric fire can be used in any room as required. The apparatus installed in each flat is as follows: A 5.9-kW G.E.C. "Magnet" cooker; a "Premier" five-pint kettle; a "Premier" 600-W iron; a 3-kW "Santon" combined wash-boiler and bath-water heater fitted with a safety cut-out; and a 2-kW "English Electric" fire. "Wylex" plugs are used and all apparatus is independently earthed with c.t.s. cable. All lampholders and switches are "Bakelite" covered and Henley's, Union, Helsby and Glover's wiring is employed.

Connections between rooms and between flats are simplified by the use of a junction box specially designed by the supply company and made by the Walsall Conduit Co.; it embodies two H.O. type fuses and a link and has four cable entries, one of which can be plugged. Current is taken from the South London Corporation's 10,500-V mains and delivered to the flats at 400/230 V; the 500-kVA transformer, which is of the British Electric Transformer Co.'s make, is controlled by Crompton-Parkinson switchgear.

Middleton House is also part of a rebuilding scheme of the Ecclesiastical Commissioners and contains sixteen flats; a further sixteen are being put up alongside and these will also be all-electric. Supply is given in this case by the Westminster Electric Supply Corporation, Ltd., initially from the l.v. distributors, but ultimately it will come from a h.v. sub-station, the l.v. connection being maintained as a standby.

The wiring was carried out by the Berkeley Engineering Co. to the specification of the supply company, which has also provided the apparatus, the standing charges as before being met in the first instance by the property owners, the company collecting the money to cover the running charges by prepayment meters.

The apparatus installed in each flat is as follows: A Jackson cooker and wash-boiler, a Premier kettle, a "Dolphin" iron (Domestic Electrification, Ltd.), with a safety cut-out, and a 2-kW Carron fire. The bathrooms of ten flats adjoin the kitchen and hot water is obtained from the wash-boiler; the other four flats have independent "Heatrae" water heaters. During the ten months that Middleton House has been connected the average consumption per flat has been 2,700 kWh.

On-load Tap-changing Equipment

ON-LOAD tap-changing equipment giving smooth voltage control, and applicable at a reasonable cost to the smaller sizes of transformers up to, say, 1,500 kVA, has been developed by the Hackbridge Electric Construction Co., Ltd., Hersham, Walton-on-Thames.

This company has for some years manufactured larger units embodying special induction regulators to provide a very gradual variation of voltage from one tapping to the next in the sequence of operation.

For small transformers, however, the use of inter-tapping induction regulators is out of the question due to cost, but the new type "TRDO" switch is a very close approximation, the voltage being varied between tappings in a large number of small steps.

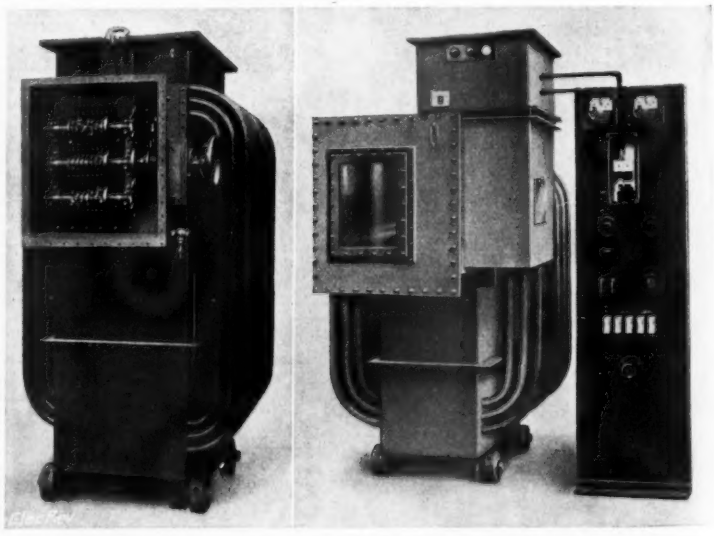
Furthermore the breaking of currents of any magnitude is limited to one amply rated contactor per phase which, once for each tap changed, is required to break only full-load current at the low voltage across one pair of tappings. The equipment can be arranged for manual, pushbutton, or fully automatic operation as required.

The main driving shaft is coupled direct to the resistance switch drum with a double set of fingers connected to permit of continuous rotation.

On the main shaft is mounted a disc fitted with a pin which moves the selector switches. When the main shaft is rotated, the pin first rotates one selector switch through a short arc. This switch then remains stationary and locked in position while the main shaft is turned through approximately 180 deg., the pin then engaging with the driving disc of the other selector switch and rotating it also through a short arc. Between the operation of the two selector switches the resistance switch passes over all the resistance tappings.

A contactor is operated by a cam on the main driving shaft to open and close at the correct times before or after the selector switches operate. One half revolution of the main shaft completes a change from one transformer tapping to the next.

The voltage change takes place in a series of small steps which can be adjusted by suitable grading of the resistance.



A manually operated type "TRDO" on-load tap-changing switch (with cover removed) fitted on the h.p. (11-kV) side of a 750-kVA single-phase transformer, and (right) a typical fully automatic installation showing a motor operated "TRDO" switch fitted to a 500-kVA transformer

The apparatus is accessibly housed in a sheet-steel chamber, the front of which is closed by an oil-tight steel cover. The whole of the tap-changing gear, including the resistance, is oil immersed, the oil being kept separate, by means of a partition, from that in the main transformer tank.

The Year's Radio Progress. By E. H. W. Banner

Things seen at the Radio Exhibition at Olympia

WHILST some battery sets are on show at Olympia at about five pounds, the demand is for a selective and powerful receiver. This is accomplished in most sets by the use of a superheterodyne and a.c. mains, although there are plenty of "straight" circuits and others for d.c. mains and batteries.

New developments in valves have accounted for numerous features, some of these being so recent that they are not incorporated as fully as is likely in the near future. The "Westector" copper-oxide rectifier is another outstanding development for radio-frequency use—and the use of iron cores, in some form, for radio-frequency circuits is also as novel as it is likely to become almost universal. The use of "q.p.p." or some modification, and "Class B" amplification have done much to improve battery sets, and will undoubtedly give an extension of life to this type of receiver, even when mains are available.

"Catkin" valves are new since last year and are certain to increase in scope. Automatic volume control has now become common, and on some sets a visual tuning indicator is fitted. Pentode valves are fairly general for the output stage, as well as screened-grid pentodes for the h.f. valve in some sets. Most of the developments are technical and do not seriously affect the appearance of the set; the cabinet work is still an important item, and embodies the moving-coil loud speaker and, usually, a minimum number of controls. Station indication is mainly by a wavelength scale with a pointer. Some sets use illuminated indication and some also indicate directly the station name.

In general, sets are purchased complete rather than constructed at home; this is due to two causes: first, that progress is so rapid that by the time an amateur has mastered all the new features, and tried out the parts, he is rather left behind, and, secondly, by the fact that the cost of parts is usually about the same as that of the complete set, due to the mass-production methods of the set makers and to the "unfinished" components used by them as against the components sold in "Bakelite" and metal cases, &c., such refinements costing money.

For those who require a simple set there are a few battery sets sold complete at about five pounds, containing batteries and loud speaker. This is marvellous value, and for price alone the home constructor cannot touch it. Other sets are priced up to £30-£50, mainly with gramophones. The general demand is for a set at between £12 and £15 and this is the main line of most manufacturers. The usual output is now about 2-4 watts, as compared with about 1 watt a year ago.

Automatic volume control is common on the superheterodyne sets; it is used primarily to deal with the fading experienced with distant stations and is often of great value when rapidly tuning from one station to another. Signals can be controlled to a maximum level and maintained—provided the station is received at at least that strength. Generally, a.v.c. is accomplished by the use of a special valve, a double-diode-triode in the h.f. circuit, but there are many variations, the new range of valves—and "Westector"—giving ample scope for the design of this part of the set. Triodes are used by some firms and a "Westector" by others—the "Westector" is the h.f. development of the Westinghouse Co.'s copper-oxide rectifier used for converting mains supply and for battery charging.

The form now common is the "quiet" type, *i.e.*, no sound is heard unless the station is sharply tuned. On some sets indicators are fitted, as it is maintained that the visual indication is much sharper than the audible. The indicator is a very simple milliammeter of the polarised moving-iron type—as used for cars—those on show being made by Ferranti, Ltd.

A general view of the exhibition and a part of the excellent lighting arrangements.

"Superhets." Predominant

The most universal set is one with from four to six valves and suitable for a.c. mains. Superheterodynes are commonest and likely to increase. By most makers it is contended that people can recognise good reproduction when they hear it, want good selectivity and plenty of volume and can afford to pay for it. For selectivity combined with good reproduction the superheterodyne circuit has the field, and the increased volume is provided usually by pentode valves for l.f. amplification. Selectivity accompanies the band-pass tuning necessary with the superheterodyne; band-pass tuning is also employed on some "straight" sets.

Improved Battery-set Outputs

Quiescent push-pull was developed some time ago, and is in fairly wide use for battery sets. In general, "Class B" amplification is better, but "q.p.p." is still in use and likely to continue. A special push-pull transformer of about 1/9 ratio is used with two valves, which consume varying anode currents, depending on the signal being received. The current is continually varying whilst the carrier is modulated, the current being a minimum when the carrier is not modulated—the condition of no signal. Pentodes are usual in order to obtain a large output with a small current consumption. A modification is the parallel-conductance method of the Marconiphone Co. The "Class B" system was developed and made known shortly after the "q.p.p.," and it is probable that had the order been reversed "Class B" would now have ousted the other. The great object of both of these systems is to obtain a good output from small power—the application is obviously to battery sets. Two valves are required, a "driver"

and an output, the driver is only a triode under another name, and the output valve is a special 7-pin valve. The two valves consume about 2 and 4 mA anode current, respectively, with no signal, whilst with a super-power valve about 45 mA would be required, or 25 mA with a pentode, for the same output to the loud speaker. The great advantage for battery sets is obvious, and this (or " q.p.p.") is likely to be practically universal for such sets for some time to come.

Two separate lines of valve development have led to modified sets and circuits. First, the use of metallised valves, which are, of course, self-screened, and metal-envelope (" Catkin ") valves, the latter needing less space in a set, and, secondly, the development of dual-purpose valves by increasing the number of elements beyond the original two of Fleming and three of de Forest. The latest valves are of the 7-pin type and are employed in several of the superheterodyne sets shown as well as in some others.

The double-diode-triode and the double-triode are at present the commonest forms, the latter being used as the " Class B " output valve. Some of the present new 7-pin valves are also supplied alternatively with five pins, having the extra screen connected internally. This is to enable makers to use them in their existing sets having 5-pin holders. The separate pin for this screen makes the valve of more universal use, however. H.f. screened pentodes are now fairly common and in most of the superheterodynes replace the old screened-grid h.f. valve.

The advantages of the " Catkin " valve are three—greater consistency, as the parts are more rigidly held; higher conductances due to the smaller clearances allowable, still being non-microphonic; and small overall size leading to smaller space required in the set. The obvious advantage—robustness, is really of less consequence as the glass valve is really extraordinarily robust, due to its approximately spheroidal shape. Glass valves usually fail by burn-out or loss of emission rather than actual breakage. In addition to the well-known makes, " Ferranti " and " Micromesh " (Standard Telephones) are on show. Ferranti's range includes a " heptode," a variable-μ tetrode acting as a frequency changer in the superheterodyne sets.

Special Radio-frequency Alloys

Until recently no iron cores suitable for radio frequencies were to be obtained. In fact it is only about a decade ago that the G.E.C. produced " Gecalloy," a nickel-iron alloy in powder form for audio frequencies, which is now used extensively for telephone loading coils. A further step was to radio frequencies, and now " Ferrocart " and " Nicore " are both serving the purpose. The use of these alloys is likely to increase and become almost universal.

" Ferrocart " is marketed by Colvern, and coils made by them are about a quarter the size of the corresponding air core coils, whilst having a 4 to 1 greater selectivity; the price is from 10 to 15 per cent. higher at present. The great achievement in both these special irons is in the production of the finely divided metal, which is insulated between particles. " Nicore " coils are claimed to have a lower h.f. resistance than " Ferrocart." The alloy is a nickel-iron which is likely to lead to the low losses experienced with the nickel-irons used for instruments at power frequencies. Varley are handling " Nicore " coils and show a tuning set comprising three ganged and matched coils, the inductance being varied by moving the " Nicore " core, no condensers, other than small initial trimmers, being used.

Both of these materials are somewhat new, and, although some sets on show incorporated one or other, in general manufacturers are testing them out more thoroughly to obtain the most out of them. The materials appear to open up a greater scope to the designer.

Several firms are already using " Westector " rectifiers, but most makers are still trying them experimentally. In some sets two are used, the Gramophone Co. using a second detector and a.v.c. of this type. Philips have a special application, and Wearite supply a " Westector " unit for incorporating in existing sets to provide a.v.c.

Loud speakers are for the most part built into the sets and usually form a part of the decoration. Permanent-magnet moving coils are usual, but some are mains excited. In the very cheap sets plain moving-iron armature speakers are fitted. For the set-owner who wishes to add a moving-coil loud speaker externally to his existing set there are many from which to choose, either for mounting at home or ready mounted in a cabinet. Tone control is common on the larger sets, some having controls to cut out either the high or the low notes at will. This may be a passing phase, as it is really a selling feature.

Power-grid detection is about obsolete, a properly designed detector circuit being better. Short-wave sets are not common but are made by a few firms—the great opportunity now is in the colonies, on account of the Empire short-wave transmissions. The Consolidated Co. shows a set covering a range of 15-2,000 metres, but this is exceptional, the usual short-wave receiver being designed for that purpose alone.

As an alternative to the superheterodyne, Philips prefer the " super-inductance " principle. This is really a modification of a straight set and has many novel features. A " Westector " is used and a.v.c. is also incorporated. Results generally similar to the superheterodyne are attained.

There is still a big market for components, and some of the

A very elaborate model—the " Grafton " baby grand radiogram

larger firms supply great quantities of such components. It is curious to find that whereas components are generally well finished in " Bakelite " or metal cases, inspection of their maker's own sets shows the bare element itself, no attempt being made to use the components manufactured by them. Sets of parts are much more popular in the North, according to some makers, Manchester in particular being a great field for the sale of components.

Car sets are being shown by two or three firms; these are for broadcast reception and for control from the steering wheel. It is possible that a new explanation of dangerous driving is in sight! These are not new for car sets have been used in the Army for a few years, the set being fitted in the dashboard in front of the passenger, two-way transmission on the move being achieved.

Instruments for testing sets, and particularly valves, are shown by several firms. There is a good scope and wide ground is covered, and the subject merits special attention.

Mention should be made of the excellent lighting of the show. A special feature is that provided by the Edison Swan Electric Co., Ltd., in the Radio Theatre, for which the British Thomson-Houston Co., Ltd., supplied sound-amplifying equipment.

Ionospheric Investigations

AN electrical means of recording automatically the ionisation of the three upper layers around the earth beyond the stratosphere has been described by Mr. T. R. Gilliland, of the U.S.A. Bureau of Standards. The device, the *Telegraph and Telephone Age* states, consists of a system which gives a curve of the virtual height against frequency of the Kennelly-Heaviside layer and the two layers above it (together termed the " ionosphere," the outside of which is some 550 miles up). The equipment comprises a transmitting and receiving set which are automatically varied in frequency from 2,500,000 to 4,400,000 cycles at a uniform rate of 200,000 cycles per minute. The virtual height is recorded photographically by an oscillographic recorder of the type previously used for fixed-frequency work. With this apparatus it is expected that much new knowledge about radio transmission and reception will be gained, and that it will be possible also to chart other regions of the outer atmosphere. It is hoped to measure for the first time the earth's magnetic forces up to distances of several hundreds of miles.

Some Driving Forces in the Industry: Siemens Electric Lamps and Supplies, Ltd.

1. Mr. S. H. Callow, director and general manager. 2. Dr. H. R. Wright (*International Rotogravure*), managing director. 3. Mr. W. H. Le Marechal, manager, electric lamp works. 4. Mr. C. H. A. Krutwig, manager, fittings and accessories department. 5. Mr. A. C. Looker, assistant manager, sales organisation. 6. Mr. A. M. Hicks (*Wykeham Studios*), secretary. 7. Mr. C. Hughes (*Haines*), manager, lamp and radio valve department. 8. Mr. C. W. Parker, manager, rubber, wire and cable department. 9. Mr. E. A. Ward, manager, electric heating and cooking department. 10. Mr. R. Kullman, manager, meter department. 11. Mr. H. S. Peet, manager, fuse and switchgear department. 12. Mr. E. Atkins, manager, battery department.

Electrostatic Precipitators. By C. C. Downie

OF recent years electrostatic precipitators have been applied to a wide field of industrial operations, but the principle of causing solid particles to deposit as a result of ionisation of the gas does not appear to have altered very materially. The different forms of precipitators that have been applied to the treatment of gases appear to resemble one another closely in that they all act on the gas or fume which is evolved from the working process in a more or less haphazard manner.

The recovery of tar from the distillation of coal has been carried out by electrostatic precipitation. A new process consists of distilling the coal in such a manner that all the valuable by-products which are evolved are caused to pass off in sections. That is, instead of the retort being simply heated up and the gases permitted to escape from a large bulk of coal, it is kept under accurate control by systematically dissecting the mass at definite convenient intervals.

Retorts were previously constructed so that the heated coal was kept stirred up by means of a large bar which revolved in the centre of the vessel. This, however, prevented any possibility of cutting open sections from the sides, and thus giving early formed gases the opportunity to escape. The design of the retorts had to be altered to meet this exigency, and the stirring is performed from the sides so that no interference will be met with when the period for dissection has been reached. The cutting of the mass is done by means of large chrome-steel cutters which are suitably geared to an electric motor, and pass through the heated coal from one side of the retort to the other. In this way, the hot mass is evenly and accurately opened up after being exposed to an even temperature for a definite period of time. The chief difficulty which beset this dissection was the need for accurate individual attention in order that the exact period should not be underestimated or over-stepped, as the gases then evolved would tend to alter in chemical composition.

This trouble was overcome by the introduction of an electrical time-setting arrangement, which operates to within a few seconds of the desired times of cutting per twenty-four hours.

Simple though this may appear, it represents the crux of the whole subject, since by suitably heating coal and drawing off the products in a systematic synchronous manner, a wide variety of separations is thus made possible. Previous experiments demonstrated that the electrostatic precipitator could deposit the different compounds by exposing the gases at various temperatures and conditions to different strong electric fields.

The object of this work is to obviate the complex system of separations at present in use for the recovery of many of the coal-tar by-products in what is generally regarded as the most complex of all chemical processes.

Experiments have also been conducted in order to ascertain other fields of possible extension in connection with waste gases and dusts from flour mills, asbestos works, and numerous other industries which are at present collected by cyclone and similar gravity systems.

The Dublin Wireless Exhibition

Preparations are being made for the holding of the annual Wireless and Gramophone Exhibition in the Mansion House, Dublin, during the week September 18th to 23rd, under the auspices of the Irish Radio Traders' Association. The whole of the available space has been booked, and a number of new exhibitors will include one Irish manufacturing enterprise.

The Woman Demonstrator. By Mabel G. Reading

Factors that make for success

THE question regarding the necessary and correct training for the woman student entering the electrical industry is definitely receiving the attention it deserves. The girl who has had a good education, and has also studied domestic science and electrical housecraft at one of the Polytechnics, is excellently equipped, and should be ready to be launched into the electrical industry. After leaving the Polytechnic she should spend at least three months in a showroom, for the most helpful training is undoubtedly gained by carrying out the daily routine work necessary to the smooth and satisfactory running of an electrical showroom. The pupil will at once realise in this training the difference between precept and practice. It is only by dealing with the public and endeavouring to answer intelligently the amazing questions that are asked that useful experience may be gained; that is why the practical training is so much more important in many ways than the theoretical instruction.

Girls taking up this work will at once realise that it is much more interesting and of greater service to mankind and womenkind than the daily routine work of a large number of educated and trained women who must earn their own living. As the industry is always introducing something new, they must remain keenly ambitious and endeavour to keep in touch through the technical papers and the very excellent lectures which are arranged for their benefit by the Electrical Development Association, the Electric Lamp Manufacturers' Association, and the Electrical Association for Women.

Many girls are interested in the cooking side of the industry and graduate for work in hotels, hospitals and canteens. This work is quite specialised and requires some knowledge of catering; moreover, it is a position that may demand a good salary. Others prefer travelling and they represent manufacturers of the large and small apparatus, which is demonstrated at public trade exhibitions. Here, again, the work is somewhat specialised, inasmuch as the demonstrator lectures and demonstrates for one manufacturer only.

Miss Mabel Reading is head demonstrator and saleswoman to the City of London Electric Lighting Co., Ltd.

Showrooms and Window Dressing

Showroom work embraces demonstrations of all electrical appliances. This gives the demonstrator the opportunity of knowing every manufacturer's goods, which is, of course, a very valuable asset. In addition to attending to customers, the work consists of dressing out the showrooms and arranging the showcases and windows, which is a very important item in the daily work. I advise all trainees to visit West End stores periodically and to examine the well-dressed windows critically. This is very valuable training, for many hints can be gained for window dressing and general showroom arrangements. Pupils handling apparatus and helping to dress windows, demonstrating the story of the apparatus with the literature which so ably tells that story, regarding thermostatic irons, kettles and appliances, are very definitely helped to talk to prospective customers with courage and confidence. They should become thoroughly conversant with the different loadings and running costs of apparatus.

I am always pleased to observe how agreeably surprised a customer is, when told that twenty slices of bread may be toasted in an hour for the cost of 1d. When the public understand that they can use an iron for two-and-a-half hours for one penny, it makes them think that "Do it Electrically!" is good advice. It is really only by actual contact with the public mind that we may be helped ourselves; this is another reason why the practical training is so much more important than the theoretical training.

I strongly advise specialised window dressing and think that one window dressed entirely with kettles and attractive descriptive literature is much more certain to attract favourable attention than if it were dressed with several different pieces of apparatus. Window dressing plays a very large part in the curriculum of some showrooms, and it demands specialised training: it is the magnet which attracts the public into the showrooms. Where practicable one large open window should be reserved for special demonstration work, such as cooking, clothes washing and vacuum cleaning, and these demonstrations, to ensure good business results, should each run for two consecutive weeks. The public are always intensely interested in any demonstration with movement. When the demonstrator has gained favourable attention, followed by the interest of the customer, it is her task to bring her knowledge and powers of persuasion to good effect and so clinch a sale.

Demonstrations of the small appliances such as kettles, percolators, irons, small cookers, hair dryers, waffle irons, &c., are useful and interesting, and may with advantage be arranged on small tables. The movement of a percolator accompanied by the delicious aroma of coffee being prepared always causes favourable attention. No demonstration should be commenced before being absolutely certain that all requirements are at hand. Nothing is more detrimental to the smooth running of a sales talk than suddenly to discover that something important is missing.

The arrangement of the showroom needs careful consideration and planning. It is an excellent idea to clear all tables each week. This removal should take place every Saturday, and each Monday the showroom may be re-dressed on a fresh plan. In this way, also, all showcases will have a periodical change round, and what is much more important, the stock will be kept in really good condition.

Courtesy and Helpfulness

Personality, deportment, and general address must play a prominent part in the equipment of every ambitious business woman. A good saleswoman must always be keyed up to give instant and understanding attention to a customer. A welcoming smile and attractive voice are a great asset and will immediately put a customer at ease. Suitable clothes and personal deportment are also important adjuncts to a successful business career. Staff members should be trained to walk forward immediately to receive a customer, which at once creates a good impression, and also conduct that same customer to the door, whether or not business has been transacted; these small courtesies are invaluable to the prestige of a showroom. No request or routine work should be too unimportant to receive the greatest attention to detail. More business friends and satisfactory results are gained by the exercise of natural courtesy than by stereotyped business methods.

A certain amount of book-keeping takes an important part in routine work, whether selling and demonstrating in a showroom or travelling about. When taking orders for work to be carried out or for estimating, it is highly important to ascertain the full name and address of the customer and all essential particulars. Taking definite orders for fittings and apparatus must be dealt with in the same careful and punctilious manner. It must also be fully understood that the telephone as a business medium cannot be given too much careful attention and handling. All calls must be answered promptly and courteously and full requirements should immediately be copied into a book provided for the purpose.

Selling is the Object

The demonstrator must always remember that no demonstration will have served any useful purpose unless the apparatus demonstrated appeals to the public mind in such a way that an immediate desire for possession is formed. Demonstrating and selling should remain firmly bracketed in the demonstrator's mind. If the demonstrator thoroughly understands the apparatus which she is demonstrating, she will be able to tell a convincing story, and it must follow, after the interest of the customer has been aroused, that a sale will be effected.

It is not necessary to be too technical when dealing with the lay public, but it is highly important to be able to answer intelligently the usual questions, as well as the unusual ones, which are asked. Unless a low-priced article has been demanded, the best obtainable should always be produced, and its special points elucidated. Automatic kettles and irons are always well worth the small extra cost. Another point of interest to the prospective user should be the service which she will obtain from the appliance. The kettle "with the brain" sounds extremely interesting as a piece of domestic apparatus. Another big selling point which should be stressed is that tea will always be made with boiling water when using an electric kettle.

The sales demonstration of the cooker concerns more intimately the manufacturer's demonstrator, and this is really important propaganda work. The practical demonstration must be very convincing from the customer's point of view, and the theoretical and technical talk simply and lucidly given. The boiling plates should be used as much as possible,

and a plain and simple meal cooked and served in a certain specified time. One very clever and successful lecturer and saleswoman makes a practice of distributing special tried recipes and useful domestic hints, and these are always much appreciated by her audiences. Personal success in this sphere is almost entirely governed by the attitude which is adopted to the public. A good demonstrator must be in entire sympathy with her audience; they will then join freely in the general discussion which should follow all really interesting demonstrations, and will not be afraid to ask questions which might make them appear ignorant.

Complaints will be many and varied, especially where electric cookers have just been installed. When sent to a house for this cause much tact and ingenuity will be required to overcome the probably quite legitimate grumble. The lady of the house should be allowed to have her little grumble, and then it can be explained to her that if she does certain obvious things the trouble will not recur. The cause of the perhaps overheated oven should be stated, and she should not be left until she feels quite satisfied that with a better understanding of the three-heat control her future results will be all that she wishes them to be.

The important question of adaptors and plug tops, whether for lighting or heating circuits, enters very largely into the selling of appliances. The interlocking plug should be given a satisfactory explanation, also the fused plug, which is now largely used for clocks.

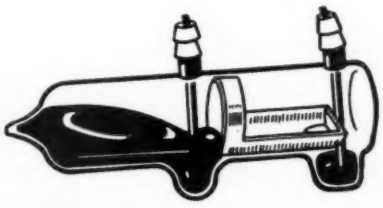
I trust that these notes will be of assistance to those women who are already engaged in the industry and those who contemplate entering it.

Mercury Switches

A growing field of usefulness

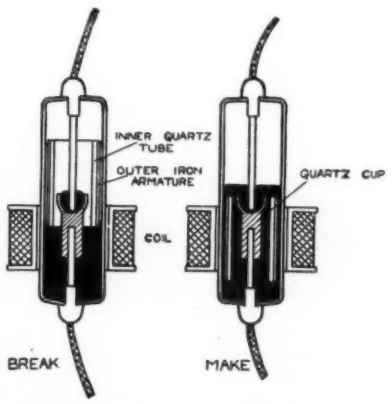
THERE has of late been a considerable increase in the uses and applications of mercury switches, and some idea as to the explanation of this was gathered during a recent interview with Mr. A. W. Isenthal, of Messrs. Isenthal and Co. Ltd. He has always been impressed with what the mercury switch will do, but he attributes at least some of his success in the mercury-switch field to a recognition of the very distinct limitations of the glass-enclosed apparatus.

The mercury switch has had a bad name largely on grounds of mechanical unreliablity, but many of the old objections have been overcome by much improved manufacturing technique. Some of the points in favour of the modern product are not generally known. In this country, at any rate, difficulties were experienced for many years in connection with the necessary glass blowing, &c. It was of much interest to learn, however, of some of the strides that have been made in overcoming these difficulties. For instance, Isenthal and Co., at their factory at Shepherd's Bush, are training lads with much success in the fusing-in of electrodes under the tuition of a German expert. These lads, on starting, have already had an initial training in glass work in the production of neon tubes under the Ministry of Labour scheme at Watford. It is appreciated increasingly that the training of these lads will prove a good thing in contributing towards the capture of foreign business. Because hydrogen is employed in the switches there is no possibility of the mercury becoming oxidised or of sustaining an arc. All parts are kept scrupulously clean in manufacture; even electrodes are smelted *in vacuo*.



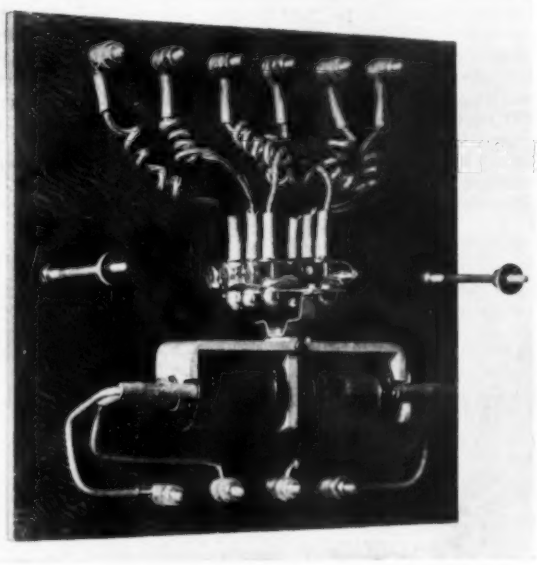
The "Stenos" protected mercury switch with a ceramic liner fused to the outer glass and specially shaped to keep the arc away from the glass

Owing to the glass being examined in polarised light after blowing there is no need for "ageing," that is, allowing a period during which inherent troubles are revealed. Contact is definitely made in the mercury appliance, although the contact pressure is negligible. Very little energy is required to work a mercury switch, although nowadays no difficulty is experienced in breaking 50 A with such an appliance. The apparatus can be used in all sorts of places where the ordinary solid switch presents many difficulties, by virtue of the fact that circuit making and breaking are carried out in a definitely sealed enclosure.



The operation of a non-tilting solenoid switch

It is, perhaps, not generally appreciated that the mercury switch will handle the same energy on d.c. as on a.c., which is not the case with the solid contact switch. Silence in operation is a strong point, too. By making the tube long enough almost any length of break can be obtained for a very small tilt. It was interesting to compare the modern English appliance, with its mercury-to-mercury break, with American mercury-to-solid metal break switches. The initial bad name is, perhaps, not the only factor which has retarded the progress of mercury switches, and maybe purchasers are in some measure responsible. People sometimes forget that the devices are made of glass, and ask for exacting dimensions, angles of tilt, &c.



An electro-magnetic relay in which two solenoids move the switch lever

It is only possible to mention a few of the most recent designs and applications, but broadly, recent advance is represented by the growing tendency to embody mercury switches in relays and by the development of the non-tilting switch. A recent introduction is the "Suprex" switch for heavy duty. For spark protection between the electrodes a quartz lining is ground into a conical seating in the outer glass tube. The expansion of quartz is very small indeed, so that frequent heating does not damage the outer tube. It is made in sizes up to 50 A., reversing and otherwise, measuring up to about 95 mm. long and 48 mm. thick over the electrode cup. A cheaper mercury switch for somewhat similar duties has a "Pyrex" lining.

Switches with time lags; quick-break and slow-make switches; devices which make circuit when revolving in one direction only; an appliance which upon being tilted in one direction closes the circuit when returned to the vertical position, but does not close the circuit when returned to the vertical from the other way; a unit which breaks several circuits simultaneously, but makes them successfully; non-tilting switches with solenoids for flasher duty, &c.; and special apparatus for electro-magnetic relays are a few of the more recent developments.

The Electrolytic Production of Hydrogen

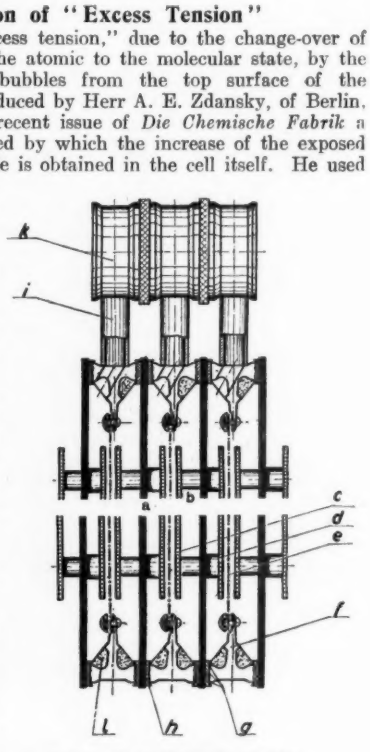
IN consequence of the cheaper electrical energy now obtainable, the electrolytic method continues to extend its application as a profitable means for the production of hydrogen. Electrolysers for this purpose are constructed in two different basic forms. The older unipole cell, consisting of plate electrodes arranged one after the other in a steel tank, ensures safety in operation, but is very big and difficult to supervise. Further, the mass of thick copper connecting bars from cell to cell increases the cost considerably, and the fact that the electrolyte comes in contact with air causes carbonising of the liquid to take place. Again, the gas can only be taken from the cells at a very low pressure, so that a blower is necessary for delivering it to the gasholder.

The filter-press type of cell has very definite advantages. A large number of electrodes are combined in a battery with inserted diaphragm frames, held together by tension rods and steel plates. Much smaller space is needed, while the many copper connecting bars are not necessary, as each electrode is connected to the next one of the same potential by a span-clip. The unit is completely enclosed, and the gases can be drawn off at a much higher pressure.

All previously known electrolytic cells worked at a current density of 500 to 1,000 A per square metre of electrode surface; a new cell, however, has been tested at a density of 3,000 A per sq. metre without the material of the electrode having been attacked. Our diagram shows a section of the cell; the separated cathode *c* and anode *d* are fixed to the main electrodes *a* by bolts *b*. In consequence of the strong production of gas at the auxiliary electrodes, the electrolyte is kept in energetic circulation as a result of which fresh parts of the electrode come continually into the active zone. The bringing together of the two opposite pole auxiliary electrodes also results in a large reduction of the ohmic resistance, this being further augmented by breaking through the auxiliary electrode, in consequence of which the gas bubbles produced pass direct immediately after formation to the back wall and thereby outside the zone of the ion stream. In addition an asbestos diaphragm *e* is provided for the reduction of the resistance, the diaphragm being so constructed by means of an interlocked mesh that the gases are kept completely separated, although the ion movement is not measurably resisted.

Reduction of "Excess Tension"

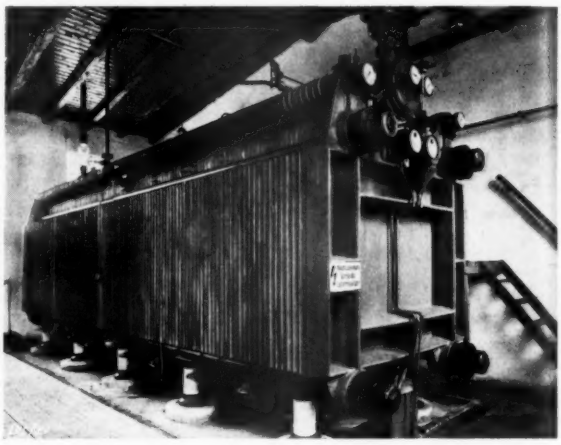
The so-called "excess tension," due to the change-over of the hydrogen from the atomic to the molecular state, by the release of hydrogen bubbles from the top surface of the cathode, has been reduced by Herr A. E. Zdansky, of Berlin, who describes in a recent issue of *Die Chemische Fabrik* a process he has evolved by which the increase of the exposed surface of the cathode is obtained in the cell itself. He used a "KOH" electrolyte of 1.35 specific gravity, with reversed current (the cathode iron plate was anode polarised) until a violet colour showed in the electrolyte, caused by a small part of iron becoming dissolved. After the reversal of current which then takes place, the dissolved iron is again reduced on to the cathode, and clings as a finely divided metal to the electrode surface.



Sectional arrangement of the "Bamag" battery

It is claimed that this method of cathode formation has suppressed almost completely the difficulty of "excess tension," so that it is possible to use a very high current density with a small cell voltage. Herr Zdansky claims that with 2.1 V the new cell in practical large-scale work will allow a current consumption of 2,500 A as compared with from 500 to 800 A. Thus the hydrogen output per apparatus-unit is correspondingly increased and accompanied by a reduction in the cost of the plant. With the lower total voltage and, at the same time, larger gas output, a large part of the heat is carried away from the cell by the saturation of the gases with steam, so that the remaining heat can be dealt with simply. Gas pressure in the anode and cathode chambers must be equal, in order to prevent direct gas mixing. By the use of specially manufactured diaphragms it is stated that a purity of 99 per cent. is being obtained in the case of hydrogen and from 99.5 to 99.7 per cent. in the case of oxygen.

A very massive cell is now being manufactured by the Bamag-Meguin Co., of Berlin, represented in this country by Bamag-Meguin (Great Britain), Ltd., Westminster, S.W.1.


General view of the "Bamag" hydrogen electrolyser

The electrodes consist of 5 mm. steel plates, while the diaphragm frame *f* is manufactured from a profiled section specially rolled for this purpose. The section has ribs *g* on the flange side which bed into the joint *h*, the high surface pressure resulting in absolute tightness of the cell against leakage of the liquid. The diaphragm *e*, which is riveted to the cell frame, is made up of asbestos nickel-steel threads. The steel frame of the mesh gives to the diaphragm a high degree of mechanical strength, and differs thereby from the asbestos diaphragm so far used. The gas passes from the cell by a pipe *l* and collects in a channel *k*. From 100 to 150 of these cells are built up together in one battery.

Reliable protection against corrosion of the steel can only be obtained by means of homogeneous nickel plating of all cell parts. A battery consisting of 125 cells is claimed to be able to produce, with a current of 5,300 A at 250 V, about 300 cu. metres (10,590 cu. ft of hydrogen per hour at 68 deg. F.) The specific energy consumption amounts to about 4.4 kWh per cu. metre of hydrogen, and over 13 cu. metres is produced per sq. metre of surface. The gas can be obtained from the battery at a pressure of 20 in. water gauge and over, and the hydrogen and oxygen generally leave the battery at 68 deg. F., so that cooling plant is not necessary.

As each battery is isolated internally and from the earth, four batteries can be switched in series with a voltage of about 1,250 V, so that a mercury rectifier can be used for converting h.p. alternating current.

Installation and Working Costs

Using cheap hydro-electric power, Herr Zdansky claims that electrolytic hydrogen can be produced in the latest type of battery at prices competitive with other methods, and appends to his article in our German contemporary the installation and working costs of a plant capable of producing 5,000 cu. metres (176,500 cu. ft.) of hydrogen at 68 deg. F. per hour.

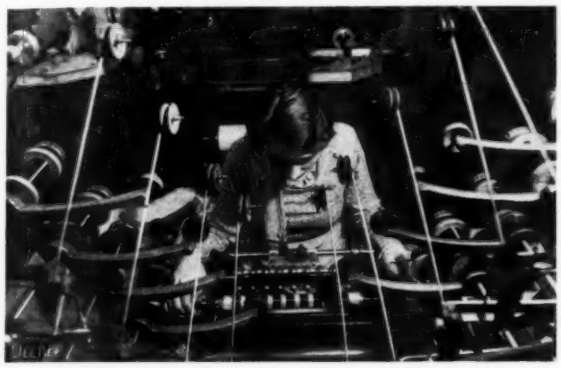
Taking the mark at the old rate of 20 to the £, the cost of installation works out at £116,000, this figure embracing twelve large batteries each comprising 150 cells (£66,000), erection costs and connections (£4,000), 100 tons of caustic potash (£3,500), three 6,500-A 1,250-V mercury rectifiers (£32,500), erection and connections (£3,500), distillation plant of a capacity of 1,100 gallons per hour, together with the necessary boilers, storage tank, with the cost of erection (£1,500) and housing about 16,150 sq. ft. (£5,000).

With hydro-electric power at 0.8 pfennig (just under 1/10d. per kWh), the author's production costs for an annual output of 42½ million cu. metres (1,500 million cu. ft.) per annum are £100,500, or approximately 0.57d. per cu. metre (35.3 cu. ft.). The operating costs include 190 million kWh electric power (£76,000), 45,000 tons distilled water (£3,000), caustic potash and sundry materials (£1,000), six men and one foreman (£3,000) and 15 per cent. allowance for interest on capital outlay and depreciation (£17,500).

The Cossor Works at Highbury

WHAT are usually called the radio works of A. C. Cossor, Ltd., at Highbury, N.5, can be more accurately described as a group of modern factories in which several businesses are carried on. Apart from the production of neon tubing and display signs and cathode-ray oscillographs, there is a large thermionic valve factory and the adjacent Kelvin works recently taken over in which broadcast receivers, constructors' kits, and moving-coil speakers are assembled; there are press and machine shops, coil winding and impregnating departments in which components are made, besides the cabinet factory which is equipped with electrically driven woodworking machinery throughout.

A prominent feature of this organisation is the manner in which intensive mass production methods are intermingled



A multiple-head machine for winding transformers

with manual operations, enabling quick changes to be introduced to meet market requirements.

In the valve works the nickel wire for the electrode supports is welded to the borated copper wire used in the glass pinch. The bending of the supports is done automatically on a machine. The winding of the grids is carried out in lengths of about one foot, the notching of the grid wire, peculiar to Cossor valves, being automatically stopped at certain distances to permit the cutting of the correct length of grid for each specified valve.

In the next operation the grids are raised to red heat to drive off accumulated grease and stretched slightly to overcome slackness and distortion. The sections of grid are then cut to their correct lengths and again stretched and straightened to their correct dimensions. The glass foot, which takes the connecting wires, the electrode supports, and the exhausting tube are made from glass tubes automatically, and one machine welds these parts together and an annealing process is carried out. In the case of pentodes and screened-grid valves, the filament and grid are assembled as one unit and the screening grid and anode as another, the two being then assembled together.

A rotating machine taking twenty-four valves continually seals the glass envelope to the foot complete with its electrodes and the bulb is then exhausted, the electrodes and bulb being heated to drive off any residual gases by eddy currents. The "Bakelite" valve-caps are affixed to the bulbs by a paste which is heated by an electric furnace on the rotary capping machine.

When complete the valve is plugged into a revolving endless track where in turn the "gettering" of the valve (absorption of final residual gases by burning magnesium heated by eddy current field) and stabilising of the characteristics are carried out by running the valve in turn with the grid and anode and then the filament and grid connected together and under the usual strain of an emission test.

Battery valves have four insulated hooks fixed to the grid which hold the filament, giving seven-point suspension to minimise microphonic noise. Metallised valves are sprayed first with a gelatine base and then with metallic oxide. Indirectly heated a.c. mains valves are made in a separate part of the factory. The tube forming the cathode is sprayed with a gun specially designed to give even spraying. The straightness of the cathode is checked as is also the quantity by weight of the emissive coating.

The Kelvin Works

In the production of condensers at the Kelvin Works, to obviate leakage through the paper dielectric two layers are wound between each layer of aluminium foil. Tags are connected to each end and middle of the foil to minimise the inductive effect of the wound spools. The latter are then thoroughly dried for twenty-four hours and impregnated with paraffin wax in a vacuum to ensure good insulation qualities. Superfluous wax is removed in hand presses, and the condensers are subjected to a breakdown test at three times the working voltage.

The spools are placed in metal cases, paraffin wax is added, and connections made to a terminal block fitted with clips after the case is filled with bitumen. They are finally tested for capacity and leakage current.

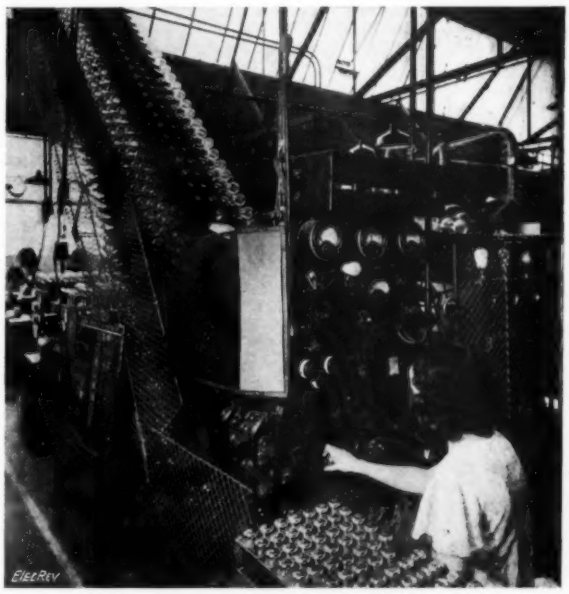
Resistances are made of porcelain rod marked in sections and passed through a furnace into which is introduced an atmosphere of nitrogen and benzine. The heat and the nitrogen causes a breakdown of the hydrocarbon benzine and carbon is deposited on the porcelain. The porcelain rod is then cut to correct lengths and metal caps are forced on each end. A carborundum wheel cuts the surface of the resistances spirally to adjust them to the required value and a glass brush is used for the final adjustment. Varnishing and labelling complete the process.

In the tool and press room are stamped out various chassis, transformer irons, condenser vanes, valve anodes, &c. Mains transformers are wound on machines winding ten coils at a time which are cut and, in addition to paper interleaving, are carefully impregnated. Potentiometers made for variable-mu screen-grid valves are assembled in one shop, together with tuning coils, and are carefully matched and tested for inductance and h.f. resistance.

In the manufacture of moving-coil speakers great care is taken that foreign matter is not permitted to foul the speech coil gap; the assembly of receivers proceeds on roller tracks and after ganging adjustment the sets are tested on reception and by oscillator. Similarly the packing of the components for "Melody Maker" kits is carried out in a series of stages on one long track.

The Modern Trend

Mr. W. R. Bullimore remarked, at a subsequent luncheon at the Hotel Victoria, that so many problems faced the maker of radio apparatus that one could do little more on an occasion like this than accept the finished instrument as the tangible result of the practical solution of the manufacturers' many difficulties. Thermionic-valve development seemed to be tending towards packing as many electrodes as possible into one envelope, which not only complicated manufacture but also



A machine which "getters" valves and stabilises their characteristics before testing

very materially added to the problem of how and in which field they should be marketed.

Mr. N. Ashbridge (chief engineer, B.B.C.) was impressed by the way mass production had enabled the prices of radio receivers to be reduced.

Mr. H. S. Pocock (Press) deprecated non-constructive criticism of the B.B.C. Those who depended for their livelihood on the sale of equipment should surely not encourage public dissatisfaction with the quality of the service. Mr. E. Brown (wholesaler) asked whether there were not "too many in the trade." Every trade must become stabilised, and it was bad policy to keep changing ideas because of claims that could not really be substantiated.

Glass Bulb Rectifiers

The special installation in the Faraday Building

THE operation of an extensive range of glass-bulb rectifiers recently introduced by Bruce Peebles & Co., Ltd., Edinburgh, depends upon the valve action of a mercury arc burning between two electrodes in a highly evacuated space, there being a one-way flow of electrons from the high-temperature cathode in the mercury pool to the comparatively low-temperature anodes in the bulb "arms."

A standard unit consists of the rectifying bulb, cooling fan, choke coils, auxiliary supply transformer, main transformer and control gear, the control gear and measuring instruments being usually mounted on the front of a polished slate panel supported by an iron framework cubicle enclosed by sheet-steel panels. The bulb and other components, with the exception of the main transformer, are accommodated inside the cubicle, so that the complete equipment is a self-contained unit.

An ignition anode eliminates tilting when starting up and consists of a tungsten electrode fitted with bi-metal strips. This normally (off circuit) dips into the mercury and immediately strikes an arc by breaking contact (under heat influence) as soon as the current is switched on. Excitation anodes automatically maintain a subsidiary arc to provide a cathode spot sufficient to keep up the arc even at no load. When the excitation and main anodes are functioning the ignition anode is kept out of circuit by a relay.

Apart from the general advantages pertaining to such equipment—economy, simplicity of control, reliability, and absence of noise—there are those associated with the more recent development—grid control.

The grid is situated near to, but insulated from, the anode and the few additional parts required are confined to providing a source of negative d.c. potential and a means of cutting off this potential at a predetermined time. The "cut off" may be arranged for either manual or automatic operation as required.

There are no moving parts and no external means for providing the grid d.c. supply, the very small current taken by the grid being provided by a 3-phase auxiliary transformer through a system of choke coils and a resistance before being rectified. The cut-off point of the negative potential controlling the d.c. voltage regulation can be controlled manually through a simple potentiometer-type resistance, or automatically to give any compounding characteristics, thus making the rectifier ideal for traction service. The compounding action is rapid and the rectifier is suitable for running in parallel with rotating plant.

Advantages of Grid Control

With a grid-controlled rectifier arranged for feeding a three-wire net work it is possible to obtain automatic and perfect balance of voltage between each outer main and neutral. This method of control also makes it possible to dispense with the current steadying resistances associated with cinema projector arcs.

An interesting example of a rectifier installation designed to meet somewhat special conditions is that supplied by the company for the new Faraday Building of the General Post Office, London. The equipment comprises two 120-kW rectifiers, each consisting of three six-anode bulbs arranged in a single- and a double-bulb cabin. The supply on the d.c. side is 220—110-V, three-wire, and the incoming supply is taken at 400 V, 3-phase, 50 cycles. A large output bulb is connected across the outers, and two smaller bulbs are connected between positive and neutral, and negative and neutral, respectively. The switching arrangements provide for the bulb across the outers being cut out on light loads, thus maintaining a high overall efficiency.

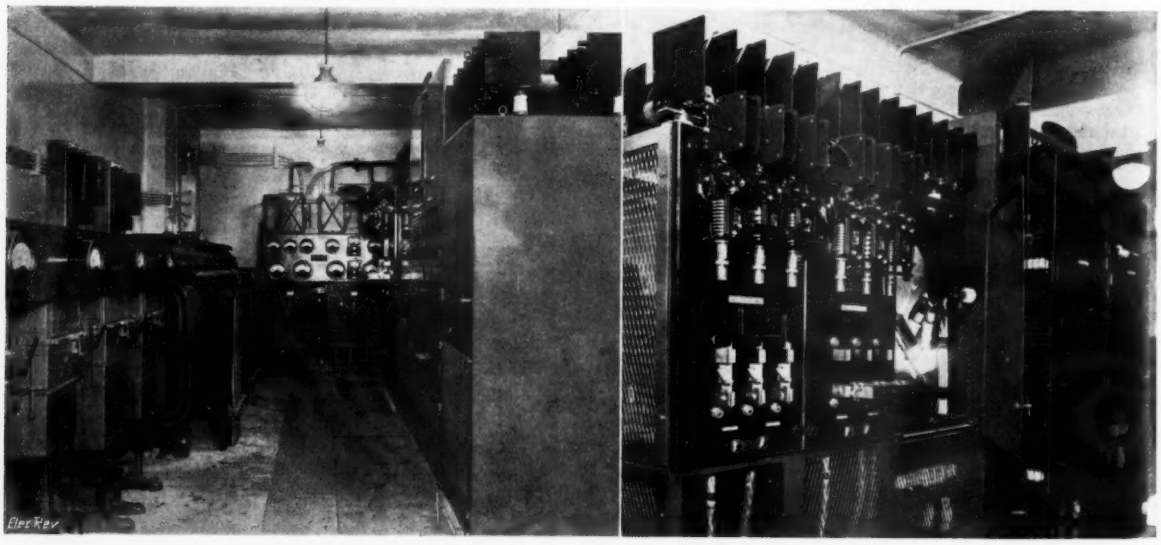
The situation of the grid in relation to the anode

The oil-immersed transformer for each equipment contains the necessary independent windings for all the bulbs and the absorption choke coils, and the windings are arranged and mounted on their respective cores in such a manner as to ensure perfect balance. The arrangement of windings in a common tank simplifies the layout and reduces the cost of cabling, such costs being confined to 3-phase primary supply cables, cables to the anodes, and the negative d.c. cables.

A wave filter system is provided to ensure that the amplitude of the harmonics on the d.c. side are so reduced as to eliminate any possibility of interference with the operation of the telephone system. This filter consists of series choke coils connected in, and resonant circuits across, the d.c. mains, the latter consisting of condensers and choke coils tuned for the frequencies given out by the rectifier. Adjustments can be made to the shunted circuit to ensure correct tuning. The equipment is self-contained, and the minimum amount of floor space is occupied.

The main bulbs are situated in separate compartments of the cubicle, and each is supported in a carriage mounted upon rollers, thus facilitating handling. Owing to the small space factor one compartment is allocated to each pair of balancing bulbs, which are situated one above the other. To ensure that the heated air from the lower bulb cannot come into contact with the upper bulb an air duct connects the lower bulb with the back of the cubicle. In the event of a fan stoppage a fan relay gives an audible alarm.

The switching arrangements are such that in closing the a.c. oil switch on the supply side, the sequence of operations which follows is automatic, and a d.c. supply is available in a few seconds, the starting up of the fan motor, ignition of the bulb and excitation being carried out by one contactor-operated switch device.



Left: The rectifier and transformer equipment in the Faraday Building. Right: One of the cabinets opened up; horn gap surge arrestors, protecting transformer secondaries, above switchgear

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Round or Flat Plugs?

I have read Mr. Arnold's letter in your issue of August 4th with interest, and submit that his comments assist my case, tending, as they do, to confirm the opinions which I expressed in my article. Had there been an insistent demand for B.S.S. plugs and sockets there can be little doubt that the electrical industry would have applied itself to meet that demand. The cry "Use B.S.S. Plugs and Sockets!" which we have grown accustomed to in and out of season, has had little effect upon the industry as a whole, and forces one to the conclusion that in this matter theory and practice are at variance.

Mr. Arnold will admit that no real demand made upon the electrical industry in the past has gone long unsatisfied. Unanimity in the electrical trades has been achieved in many matters affecting supply and demand. If there is disagreement over the matter in question, surely it is due to the questionability of the demand rather than to the unresponsiveness of the industry. The interchangeability of lamps was a matter of unhesitating trade agreement; the interchangeability of plugs is altogether another matter. The lamp has a short life, and its replacement is normally effected by the consumer himself. Its nature allows a wide tolerance and does not involve the problems inherent in the plug, which is a durable fixture of an altogether different character.

I still maintain that whilst a manufacturer can produce plugs and sockets interchangeable with others of his own make the small tolerance permitted to these fixtures would make the interchangeability of plugs and sockets of several makes impracticable without seriously affecting their reliability in consequence of the wide tolerance necessary. On this point alone the case for universal interchangeability breaks down.

Interchangeability in any individual building is desirable and is easily achieved, and there should be no difficulty whatever about additions or replacements. One can obtain a particular make of socket or plug as easily as a particular make of razor blade or hat, or anything else for that matter. I have said nothing, and would say nothing, in disparagement of the B.S.I. I have the greatest confidence in the work that it is doing, but I hold that this work should continue to be qualitative, and that its investigation into the matter of plugs is more properly concerned with effective contact rather than interchangeability.

R. W. WILLIS.
Engineer and Manager,
Cheadle and Gatley U.D.C. Electricity Dept.

Cheadle, *August 10th.*

Advice to Intending Engineers

Permit me heartily to congratulate your correspondent Mr. E. G. Pink on the constructive criticism in his letter in to-day's REVIEW. It is but a fool who merely finds fault, but it is the man of discretion and knowledge who when he detects a fault shows the better way. My personal interest is that the theme of his letter is analogous to that contained in previous notes of mine and to the campaign which I am carrying out in the local Press. Whilst I have not yet attacked the question of jobbery, I have definitely shown that municipal staffs are supercharged with a dose of "friends of councillors' friends."

If any appointment for a public position is made by any other means than by open competition as a test of fitness, qualifications, and training, a challenge is thrown at the schemes of technical education upon which so much public money is spent. Those who gain a post by any other means than by open competition get their rather false confidence by suggesting to themselves that they are of no mean importance. Of course, such an attitude can never lead to general good, as recent cases have shown. The times demand that any wastage of public money must be prevented. Real economy will only be attained by ensuring that the staffs are fully trained and have good health.

BERNARD A. CRONIN.

Cardiff, *August 12th.*

Divers were engaged to lay two 33-kV cables on the bed of the Thames at Mapledurham in connection with the Reading-Pangbourne contract for the Central Electricity Board.

The Rateable-value Charge

According to recent letters and my own experience the matter of electricity charges appears to be very little understood; as a matter of fact it is a very complicated problem and extremely confusing to the lay mind. There are no varying qualities of electricity and yet we are faced with all sorts of charges for current, each town or supply having different rates for lighting, heating, cooking, etc., and in addition most towns offer alternative methods of charge. The puzzled consumer, quite reasonably, asks why?

With such a complicated problem one can easily understand the letters and articles from such laymen as W. B. Parker and "Domestic Consumer," but really one is at a loss to understand the mentality of a man of "nearly twenty years' experience" with his comparison to a baker's business and who signs himself "Sales Engineer"—whatever that may mean. Really it should be unnecessary to reply to "Sales Engineer," but unfortunately such letters, emanating apparently from an authoritative source, help to encourage the erroneous ideas of laymen who, quite reasonably, cannot be expected to be *au fait* with the peculiar conditions of electrical distribution and supply. Electricity is not sold at "so much per unit" for the same reason that calico is not sold at "so much per pint," the commodity not lending itself to the method. At any time the baker can ascertain his exact cost per loaf, but in the case of electrical supply, however large or small the undertaking, no accountant is able to compute the cost per unit at any given moment.

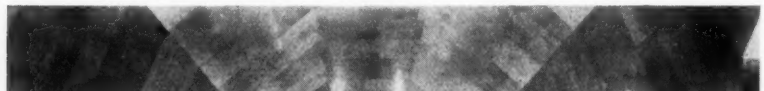
The subject is so huge that one could easily fill your next issue, but please allow me one illustration, *viz.*, that of two consumers each with a maximum demand of one kilowatt. Unlike gas or bread, electricity cannot be stored, it must be generated as and when required, therefore generating plant and distributing mains must be provided for the largest amount of current that will be required at any time. There is no give or take, no matter for how short a period the maximum amount of current is called for there must be installed plant and mains of sufficient capacity to meet the demand, notwith-

standing the fact that for long periods much of this plant and mains will of necessity be standing idle.

For our two consumers the supply authorities must earmark plant and mains at any time capable of supplying two kilowatts; consumer "A" requires his kilowatt for shop lighting during the usual business hours and consumes about 300 kWh per year. "B" requires his kilowatt for cooking purposes and consumes 2,000 kWh in the year. Each consumer has necessitated that same amount of plant and mains, but "B" has called for nearly seven times the amount of energy consumed by "A." As the charge for energy should be generation plus standing charges, it is obvious that "B" should be charged very much less than "A" per unit, and if we consider that conditions vary practically with every consumer it will be seen how utterly absurd is the suggestion that electricity should be sold "as the baker sells his bread at so much per loaf." These apparent anomalies could be multiplied *ad lib.*

Charles Gates.

Norwich, *August 12th.*



A highly efficient lighting scheme has just been completed at St. Andrew's Church, Cheam. G.E.C. lighting fittings and "Osram" lamps were used

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In the leading article in your current issue under the heading "The Two-part Tariff" you express the view that the low unit charge necessary to encourage greater consumption is only possible on account of the fixed charge. If the revenue from units for other purposes than lighting is to be increased by a portion of the standing charge, then it is presupposed that the consumption for lighting only must cost more on the two-part tariff than on the flat rate. How can the two-part tariff be expected to encourage an increased consumption under such conditions? It is far more likely to encourage the consumer to continue to use a minimum number of units on the lighting flat rate and to use gas for all other services.

In actual fact, of course, the change to the two-part tariff is only made when it shows a saving over the lighting flat rate, and therefore the running charge must be able to stand by itself as a remunerative rate for cooking and heating. For example, if there are two similar adjacent houses, one already on the two-part tariff with a unit charge of, say, ½d. and the other still on the lighting flat rate because the change-over would mean an immediate increase in the bill, it obviously would not matter to the supply authority if a cooker was to be installed in which of the two houses it was connected. Yet in one case the cooking consumption would be cheerfully supplied at ½d. per kWh while in the other case it would usually be considered unscientific and uneconomic to offer a flat rate anywhere approaching this figure.

While there is nothing wrong with the two-part tariff as an alternative to reasonable flat rates, it is quite hopeless as a standard domestic tariff for universal adoption. Moreover, there are two reasons why it is even less likely to become universal in the future. The first is that by means of assisted-wiring schemes electricity is entering the homes of a class of consumers who are most unlikely to commit themselves to a fixed payment. The immediate success of the flat rate of a penny a unit for lighting and cooking at East and West Ham proves that it is only a question of tariffs which is preventing the adoption of electricity by these small users for other purposes than lighting.

The other reason is that it can only be a matter of time before gaseous lamps suitable for domestic lighting become available. When this takes place it will be possible for the consumer to effect a considerable reduction in lighting consumption which will make a change to the two-part tariff still less attractive unless there is a general reduction in standing charges.

W. B. Parker.

Monkseaton, *August 12th.*

Surely "Sales Engineer" in his letter is entirely wrong in his statement that there is no difference between a baker's business and the electricity supply business. Does he not realise that when a householder buys electricity he pays more for "distribution" than for "production"?

If a householder goes to a baker's shop he can pay for his bread and take it with him. If a householder went to an electricity supply station and took his electricity from the busbars he could probably buy it more cheaply than he can when it is delivered to his own house; it costs the supply authorities far more to distribute to small houses than it costs to produce the electricity they use. This distribution charge remains practically the same whether householders use their current generously or parsimoniously. In a baker's business this is not the case.

J. M. Seddon.

London, W.C.2, *August 12th.*

Industrial Switchgear

The technical public on reading your leading comments on industrial switchgear will be grateful to you for drawing attention to one of the chief factors of the success of this class of gear; this is that it shall be capable of releasing successfully the amount of energy on short-circuit. If the purchasing public would only solicit the advice of qualified engineers or manufacturers and be prepared to select the most efficient article such failures as are reported would cease.

My company has not experienced a failure or even a breakdown, principally due to the fact that its designs are based on scientific lines and are produced by expert designers and fitters. We should like to emphasise particularly the desirability of selecting designs without bias for any particular manufacturer, as trading on a name may be exploited to the detriment of the material supplied, and the avoiding of those who employ juniors at small salaries with little experience for carrying out this work.

A. G. Collis,
Technical Director,
Standard Switchgear, Ltd.

London, W.C.1, *August 12th.*

Single-phase Meters for Three-phase Circuits

THE use of three single-phase meters instead of a three-phase meter offers important advantages, says F. Raynaud in *Revue Générale de l'Electricité*, whether the measurement be made in a high- or low-voltage circuit. The single-phase instruments make possible a greater overall accuracy of measurement, and effect corresponding savings under service conditions. Errors arising from incorrect connections and/or circuit faults, where high-voltage two-element meters are concerned, are readily avoided by the use of three single-phase meters. Though an accuracy of 0.5 per cent. or better may be attained in the calibration of a three-phase meter, the failure of a fuse or the burning-out of a shunt coil may introduce an error of 20 per cent. and lead to the dissatisfaction of the consumer.

A number of rural and other supply authorities have replaced three-element meters by single-phase instruments for the following reasons: (1) Calibration is simpler. (2) If a shunt coil breaks down, the fault is obvious next time the meter is read, and a close approximation to the true energy consumption can be deduced from the readings of the other two meters. With a three-element meter, a loss of 33 per cent. may result from the breakdown of a shunt coil, and cases have been found where two shunt coils have been out of action in the same meter. (3) Only the faulty meter has to be removed for repair, and, if necessary, the energy consumed can be charged from the readings of the other two instruments until the third is replaced. (4) Three single-phase meters are cheaper than a three-element instrument, and the cost and variety of meters which have to be kept in stock by the supply undertaking are reduced.

Defects in shunt coils, leading to serious errors in recording, are even more liable to be overlooked where two-element meters are used in three-phase, three-wire low-voltage circuits. On the other hand, with three single-phase meters the fault cannot escape detection, and, the load being balanced, the true energy consumption is easily computed. The author estimates that the losses resulting from the use of two-element meters may be of the order of 10 per cent. of the receipts, particularly in rural districts.

Lock Electrification in France

Some details of the Suresnes installation on the Seine

THE locks on the River Seine at Suresnes immediately below Paris have recently been completely electrified by the Société des Etablissements Hillairet, of Paris, under the direction of the French Departments of Roads and and Bridges, and Public Works. There are two locks arranged side by side at this part of the river where a maximum difference of level of about 11 ft. has to be dealt with. The new lock on the land side is 580 ft. in length, and the old lock is divided into two basins, one 393 ft. and the other 187 ft. long. The width of the gates, of which there are six, is in all cases 39 ft.

General view of the Suresnes lock system

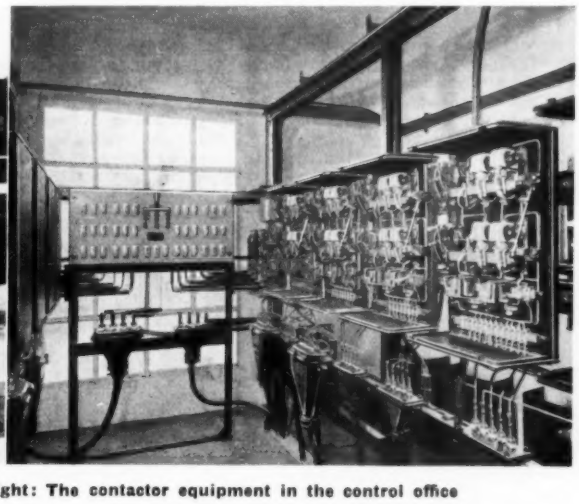
The control mechanism is so arranged that at no time can that portion working the upper gates and sluice valves be connected with that operating the lower. In addition, the control gear ensures that operations cease when the desired water level has been attained and also stops the motors when foreign floating bodies become entangled with the sluice valves or gates. The control gear, which was constructed by the Société La Télémécanique Electrique, of Nanterre, to which we are indebted for the accompanying illustrations, is housed in two small buildings at each end of the wall dividing the two locks, and is in charge of one lock-keeper. The armoured watertight controllers are mounted under shelters outside the control offices opposite to the corresponding lock basins; they are provided with a detachable key which, engaging in a T-shaped slot, can by a transverse movement rotate the controllers of the motors in one direction or the other. The controllers of the sluices and registering valves are fitted with a device by means of which they can be instantly brought to the zero position, while the contactors, if stopped automatically, can be restarted only by bringing the controller handle back to the initial position. Lamps indicate the positions, open and closed, of the lock mechanism, with which they are connected. The necessary 200/115-V, three-phase, 50-cycle power is derived from a neighbouring transformer station.

Sluice Valve Control

Each of the eight sluice valves is provided with a 2-h.p. motor with three-stage reduction gear and a dog clutch, and also a distributor driven by gear wheels for actuating the end-of-movement "stop" and locking contacts. To prevent eddies that might be dangerous to vessels in the vicinity of the lock entrance channels, the division of the sluice valve operation into two stages is effected by an automatic starting and stopping device, which can be put in and out of action by the lock-keeper by means of a push button on the controller casing.

Each wing of a lock gate is provided with a pair of registering valves, actuated by a 1-h.p. motor through a chain drive and reduction gearing. The four valves of a lock gate are operated by a single controller connected to two sets of contactors. Each half lock gate is driven by a 4-h.p. motor with clutch and three-stage reduction gear. A single controller is provided for the two motors of each complete gate. The automatic end-of-movement "stop" contacts cut off the power supply to the motors and also bring into action an electromagnetic brake. Should an obstacle interfere with the opening or closing of the gates, means are provided for the motor to overrun, with the result that the overload brings the protection relays into action.

All the outdoor electrical equipment is of the armoured watertight variety and is so arranged that in times of flooding of the River Seine it may be readily dismantled and removed. As a result of the installation, the traffic along the river has been considerably accelerated, over 200 boats and barges now passing through the locks every day.



Left: One wing of the upper gate of large lock. Right: The contactor equipment in the control office

American Copper Consumption

About half the copper used in the United States goes directly into electrical materials and supplies, according to estimates in the Year Book of the American Bureau of Metal Statistics. These electrical uses during recent years, with totals for all purposes for comparison, are given in tons of 2,000 lb. as follows, in the *Electrical World* :—

Purpose.	1929.	1930.	1931.	1932.
Electrical manufactures	261,000	221,000	162,000	90,000
Telephones and telegraphs	164,000	122,000	70,000	27,000
Light and power lines	127,000	130,000	85,000	41,000
Radio receiving sets	15,500	13,000	10,000	7,000
"Electrical" totals	567,500	486,000	327,000	165,000
U.S. totals	1,159,800	956,150	650,000	360,000
Per cent. electrical	49	51	50	46

World production in 1932 aggregated 972,720 tons of 2,000 lb., of which North America produced 424,408; South America, 140,985; Europe, 150,482; Asia, 88,373; Australasia, 16,510; and Africa, 141,962.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Window Display Turntable

Because a moving object attracts attention more readily than a stationary one, window display turntables, such as those made by the S.F.P. ELECTRICAL CO., North Bar Works, Banbury, have been introduced.

A 6-in. "S.F.P." turntable

This company is marketing a 6-in. model which will carry up to 10 lb. and is priced at 32s. 6d. with a low loaded a.c. motor. Larger models with a 10-in. diameter table to carry up to 100 lb. are also available at 42s. for a.c. only and 56s. for a.c. or d.c.

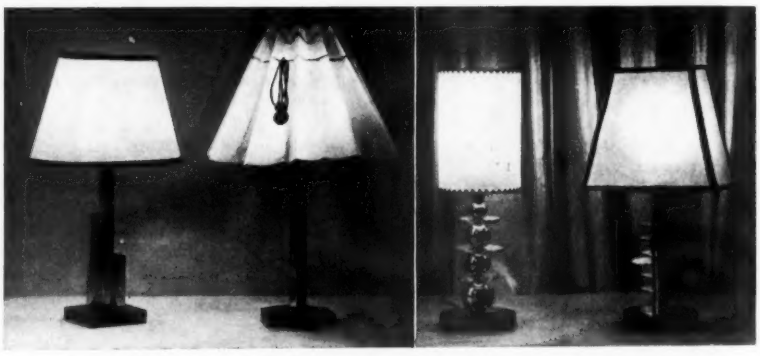
The turntables can be supplied with sliprings so that the goods exhibited can be illuminated during the dark hours.

Modern Lighting Fittings

A number of new chromium-plated lighting fittings are being produced by the 20TH CENTURY ELECTRICAL, 30, Gerrard Street, London, W.1. Our illustration shows four of the new table lamps priced as follows without the shade: Model L. 621, trio, 25s. 6d.; L. 620, hexagonal, 18s. 9d.; L. 623, chromium-plated balls with glass discs, 31s. 6d.; and L. 622, chromium-plated discs, 31s. 6d., all these models are wired with a push-switch in the base.

A new spiral base floor standard is priced at £2 12s. 6d., and a chromium torchière standard for 100/150-W lamps, with a stove-black enamel base, costs £4 17s. 6d.

With the exception of the pleated shade, which is of "Celastoid," the shades are of "Oyster Vellon," a material which gives good diffusion, is robust and will not readily mark or dent. Another property of this substance is that it is washable, and may be scrubbed with a stiff-bristled brush when dirty.

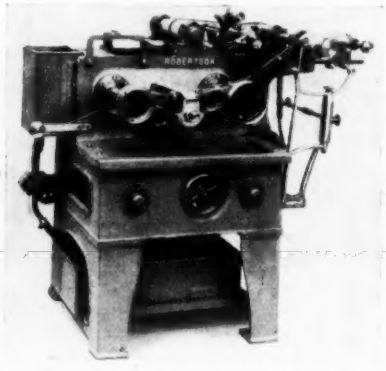


New "20th Century" fittings: models L. 621, L. 620, L. 623, and L. 622

Wire-drawing Machines

A high-speed fine-wire-drawing machine recently developed by W. H. A. ROBERTSON & CO., LTD., Lynton Works, Bedford, will draw ferrous and non-ferrous metals to any diameter between 30 and 50 s.w.g. on spools of from 1.25 to 4 in. core diameter and from 1.5 to 4.5 in. traverse, hard drawn or loosely spooled for annealing, while an attachment makes possible the use of spools down to 0.75-in. core diameter. A variable speed ratio of 50 per cent. gives spooling speed of 2,000 to 4,000 ft.p.m. at will while the machine is running.

The patent figure "8" system of stringing-up utilises all the cones for drawing, there being no idlers, facilitates threading, and allows a much greater cone step width than usual. The wire is traversed across the cone, preventing cutting-in and reducing surface wear. Patent die box and holders are used; each die is adjustable separately in any plane and set exactly at right angles to the wire, which important feature reduces die wear to a marked extent. The wire cannot touch anything but the die on its way from cone to cone, and the pull on the die box is balanced as nearly as possible in each direction.



A high-speed fine-wire-drawing machine

The special automatic spooling gear is believed to be the first which definitely controls the speed of the spool as each layer of wire is added, the tension of the wire being maintained throughout, while the speed per layer can be varied by very small amounts and reset exactly. Lubrication has had special attention and all high-speed shafts of the machine run in ball bearings.

Should the machine be left running accidentally, the spooling shaft will stop automatically at the end of the spooling traverse. A driving motor of from 0.5 to 2 h.p. is needed, according to size of wire being drawn. The weight of the machine complete is 950 lb. and it is 48 in. long, 33 in. wide, and 45 in. high.

E.M.B. Haulage Units

The "E.M.B." haulage unit is an addition to the range of control gear for mines made by the ELECTRO-MECHANICAL BRAKE CO., LTD., Moor Street, West Bromwich, the one illustrated being suitable for the speed control of a 50-h.p. slip-ring motor installed on the surface.

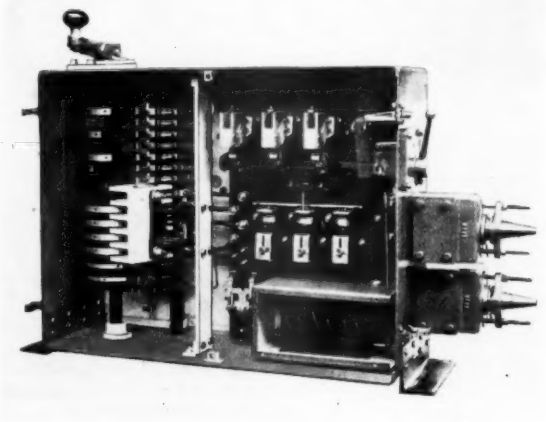
The complete unit consists of two parts: a heavily rated reversing stator and rotor controller, a triple-pole contactor panel, and an isolating switch, all compactly housed in a steel case; and a separately mounted "E.M.B." unbreakable resistance.

The controller is of the standard "E.M.B." heavy duty type fitted with large-diameter drum and substantial fingers. On the protective panel is mounted an "E.M.B." triple-pole contactor of new design which takes the make-and-break of the stator current; no current is broken on the drum of the controller. Adjustable time-lag overload relays in the stator circuit and a no-volt coil in the contactor coil circuit give protection against overloads on the motor, failure of supply, or excessive drop in voltage.

The isolating switch is mechanically interlocked with the cover and is also electrically interlocked with the contactor coil, thus ensuring that the main current is broken before the cover is removed, and all parts are dead while the cover is off. The actual isolating switch and main terminals are enclosed in a separate steel compartment fitted with a steel cover, enabling the operating parts of the control unit to be inspected without risk of contact with live terminals.

These haulage units can be supplied either in industrial-pattern cases with mild steel, dust and weatherproof covers or in flameproof cases to comply with Rule 132 of the C.M.R. Conduit flanges, trifurcating boxes or other cable fittings can be arranged to suit customers' requirements.

Resistances can be supplied in various ratings in open weatherproof or in flameproof cases to comply with the requirements of the Buxton certificate.



A 50-h.p. E.M.B. control unit

South African Electrical Imports

THE following statement showing the values of electrical goods imported into the Union of South Africa during 1932 has been compiled from the recently issued official statistics.

A separate column gives the increases or decreases compared with the previous year. It will be seen that the decreases predominated, as was the case between 1931 and 1930. In addition to the items mentioned in the table there were imported last year on Government account a quantity of electrical material including batteries (£6,000); dynamos, motors and transformers (£2,500); electric lamps (£6,000); and telegraph, telephone and radio material (£113,000).

	1932. £	Inc. or Dec. £
Radio apparatus and parts—		
Total	114,000	— 159,000
From United Kingdom	14,800	— 12,700
„ United States	84,000	— 30,000
„ Germany	2,800	— 14,200
„ Holland	12,900	— 70,100
Telegraph and telephone material—		
Total	18,000	— 19,000
From United Kingdom	13,000	— 12,000
„ Sweden	1,300	— 2,200
„ United States	1,600	— 100
„ Germany	1,500	— 5,000
„ Belgium	500	—
Dynamos and generators—		
Total	10,000	— 33,000
From United Kingdom	6,900	— 32,100
„ Germany	1,200	— 1,000
„ United States	900	— 100
Batteries, primary—		
Total	65,000	— 68,000
From United Kingdom	27,000	— 10,000
„ United States	32,000	— 53,000
„ Germany	3,000	— 3,000
„ Denmark	2,000	— 1,000
„ Belgium	—	— 2,000
Batteries, secondary—		
Total	40,000	— 3,000
From United Kingdom	21,000	+ 1,000
„ United States	17,000	— 2,000
„ Germany	1,300	— 300
„ Holland	—	— 60
„ Sweden	200	+ 170
„ Denmark	120	— 180

	1932. £	Inc. or Dec. £
Motors—		
Total	86,500	— 47,500
From United Kingdom	56,000	— 26,000
„ United States	14,000	—
„ Germany	8,300	— 5,200
„ Holland	3,500	— 1,100
„ Sweden	700	— 11,800
„ Denmark	500	— 400
Transformers—		
Total	87,000	— 15,000
From United Kingdom	66,000	+ 17,000
„ United States	6,000	— 10,000
„ Germany	8,300	— 15,700
„ Holland	3,200	— 1,800
Electrical machinery, other—		
Total	909,000	— 60,000
From United Kingdom	470,000	+ 34,000
„ United States	62,000	— 38,000
„ Germany	48,000	— 50,000
„ Sweden	19,600	+ 11,200
„ Holland	1,600	— 3,800
„ Switzerland	2,500	— 9,300
Electrical cable and wire—		
Total	222,000	— 261,000
From United Kingdom	198,000	— 216,000
„ United States	2,000	— 1,500
„ Belgium	15,600	— 23,400
„ Germany	3,000	— 2,000
„ Holland	2,300	— 13,700
Heating and cooking apparatus—		
Total	142,000	— 78,000
From United Kingdom	44,000	— 16,000
„ United States	26,000	— 10,000
„ Germany	9,600	— 6,100
„ Canada	59,000	— 19,000

	1932. £	Inc. or Dec. £
Electric meters—		
Total	34,000	+ 6,000
From United Kingdom	30,700	+ 6,700
„ Germany	1,900	— 1,200
Insulators (not porcelain)—		
Total	—	— 700
Insulators (porcelain)—		
Total	9,700	— 11,800
From United Kingdom	7,200	+ 3,500
„ Germany	800	— 1,700
„ United States	600	— 3,600
„ Canada	500	— 9,700
Electrical material (other)—		
Total	45,000	+ 5,000
From United Kingdom	10,500	— 5,300
„ United States	6,500	— 2,000
„ Germany	6,800	— 1,400
„ Italy	1,500	— 800
Electric hand lamps—		
Total	8,300	— 7,700
From United Kingdom	700	— 400
„ Germany	1,500	— 2,300
„ United States	5,200	— 4,700
Other electric lamps, globes, etc.—		
Total	118,000	— 5,000
From United Kingdom	53,000	+ 12,000
„ Austria	9,100	— 200
„ Germany	7,300	— 6,700
„ Holland	27,000	— 5,000
„ United States	7,000	— 2,000
„ Hungary	3,500	— 4,800
Electric lighting outfits, self-contained—		
Total	2,000	— 3,500
From United Kingdom	1,000	— 1,000
„ United States	1,000	— 1,700

New Zealand's Electrical Trade

THE New Zealand Government has recently printed its annual returns of foreign trade for 1932. The following table gives the values of the imports of electrical machinery and apparatus for that year, together with notes showing the increases or decreases as compared with the preceding year :—

	1932. Thous. £	Inc. or dec. as compared with 1931. Thous. £
Batteries and cells —		
Total	133	+ 26
From United Kingdom	66	+ 28
„ Canada	19	— 6
„ United States	10	— 19
„ Australia	35	+ 13
Insulated cable and wire—		
Total	100	— 75
From United Kingdom	96	— 68
„ Holland	1	— 3
„ Sweden	1	+ 1
„ United States	1	— 1
Insulators—		
Total	12	— 14
From United Kingdom	7	— 7
„ Canada	1	— 9
Filament lamps—		
Total	103	— 13
From United Kingdom	96	— 8
„ Holland	2	— 3
„ United States	4	— 2

	1932. Thous. £	Inc. or dec. as compared with 1931. Thous. £
Other electric lamps—		
Total	9	— 4
From United Kingdom	4	— —
„ Germany	1	— 2
„ United States	2	— 2
Electric ranges—		
Total	8	— 13
From Canada	3	— 15
„ United Kingdom	4	+ 1
Wireless receiving sets—		
Total	98	— 50
From United Kingdom	9	+ 7
„ Canada	7	— 3
„ United States	71	— 49
Other wireless apparatus—		
Total	151	+ 39
From United Kingdom	25	+ 5
„ Germany	1	— 1
„ Holland	5	— 4
„ United States	79	+ 8
Other telegraph and telephone apparatus—		
Total	12	— 57
From United Kingdom	8	— 32
„ Belgium	1	— 7
„ United States	1	— 5

	1932. Thous. £	Inc. or dec. as compared with 1931. Thous. £
Other electrical apparatus (duty free if British)—		
Total	212	— 253
From United Kingdom	161	— 166
„ Canada	1	— 4
„ Germany	4	— 3
„ Sweden	7	— 44
„ Switzerland	1	— 3
„ United States	23	— 26
Other electrical apparatus) (dutiable)—		
Total	42	— 26
From United Kingdom	27	— 12
„ Canada	3	— 1
„ Germany	2	— 2
„ United States	3	— 7
Motors—*		
Total	53	—
From United Kingdom	36	—
„ Germany	6	—
„ United States	7	—

* Previously included under other electrical apparatus.

The Indian Radio Market

DUE to the language question the Indian Empire, as a market for radio apparatus, presents an entirely different problem from the United Kingdom. A Department of Overseas Trade report on the subject says that in both Calcutta and Bombay it is necessary to have two programmes, European and Indian, and this to a certain extent limits the popularity of the service. With the opening of the Empire Broadcasting Service, however, sales of receivers to Europeans have received a decided fillip.

In Western India the market, considered in relation to the total population (even allowing for the fact that an exceedingly small proportion can be considered potential purchasers from the point of view of means) offers a good deal of scope. The development of broadcasting has, however, been exceedingly slow and again the language difficulty is an important obstacle.

The evasion of licence revenue is another serious retarding factor. In the early years of broadcasting it is said that not twenty per cent. of the users were licence holders. Another difficulty exists in the unfavourable atmospheric conditions—particularly during the monsoon.

To attain success in the market it is essential that manufacturers of radio apparatus should produce a standard set at a moderate price and above all should have a good service system. Crystal sets are of little use, loud-speaker receivers with two or three valves being the most popular. Portable sets are not in favour, but there is a fair demand for radio-gramophones.

In Calcutta, Bombay, and other large centres, the demand for all-mains sets is increasing, not only because of the tendency in most centres in this direction, but because batteries deteriorate much more rapidly in the tropical atmosphere. There are, however, many up-country centres where no electricity is available, and where battery receivers will still be required.

Of radio apparatus to the value of Rs. 9,38,330 imported during 1931-32, Great Britain's share amounted to Rs. 6,63,455, which compares with Rs. 4,96,976 out of a total of Rs. 7,63,357 in the preceding year. In 1932-33 the percentage of British goods had increased to 80.8 (Rs. 8,39,572 out of Rs. 10,37,933). It must be remembered, however, that the above figures include apparatus used in commercial radio communications.

Italian Electrical Imports and Exports

The imports of electrical machinery, apparatus and cognate material into Italy during the four months ended with April last attained a value of £518,455, as compared with £766,345 in the corresponding four months of 1932. There was also a decline during the same periods in the exports of similar material from £636,865 to £231,195.

New Books

Advanced Electrical Measurements, by W. R. SMYTHE and W. C. MICHELS. Pp. 240. Figs. 110. London: Chapman and Hall. Price: 15s.

This book is based upon a series of laboratory instructions prepared for students of electrical engineering and chemistry in the California Institute of Technology. The scope is considerably wider than that of the usual laboratory manual, and, in addition to chapters on the measurement of fundamental electrical quantities, there are instructive sections covering the testing of vacuum tubes, the calibration of pyrometers and resistance thermometers, and measurements relating to radiation and electrochemistry. The theory of the various methods of measurement is treated very fully, and for this a knowledge of elementary mathematics up to simple differential equations is required of the reader. The book opens with a very useful chapter dealing with the calculus of observations and the theory of errors. The work is well illustrated, but its value to the student might have been increased had some typical numerical evaluations of experimental results been worked out. The bias of the book is distinctly theoretical, and little attention is given to the subject of precision measurement of power and energy in a.c. circuits. The reference to the a.c. potentiometer is also surprisingly scanty, in view of the versatility of this instrument in the sphere of research work.

Subject to these minor limitations, the book can be said to present a concise and comprehensive survey of the theory of laboratory electrical measurements. It should be of great assistance to students of electrical engineering who are specialising in this subject for their final examinations. As a general work of reference it is worthy of a place in the libraries of all testing laboratories.

Travelling Waves on Transmission Systems. By L. V. BEWLEY. Pp. 334; illus. London: Chapman & Hall. Price: 28s.

This book was written to provide a reference text for the use of the advanced course in engineering of the American General Electric Company. It is divided into two parts, the first dealing with the origin, characteristics and behaviour of travelling waves and the second part with the effect of surges on transformers. Mathematical solutions are given for the terminal transients and internal oscillations in a transformer for an applied surge of arbitrary shape as well as for an infinite rectangular wave. A theoretical discussion on the non-resonating transformer is given in the last chapter. Many applications are mentioned of the lightning-arrestor material known as "Thyrite" which was developed by the General Electric Company.

A treatise on travelling waves must almost inevitably contain much mathematical analysis, but in the present case the author has succeeded in keeping the theoretical and practical aspects of the subject well balanced and the analytical solutions are usually illustrated by means of excellent oscillograms. A knowledge of the operational calculus is necessary if the text is to be perused in detail, but engineers not possessing this knowledge will not find that the book is of appreciably less value to them on that account.

The book is very convenient for reference; a summary is given at the end of every chapter, and there is also a good index and a fairly comprehensive bibliography. In addition, an appendix of useful formulæ is provided. The only addition which might be desired is a list of the symbols employed in the text. In most cases the notation is very clear, however; but the use of "ms" for "microseconds" is unusual. The typography and diagrams are of a high standard.

Although in this country lightning troubles do not present such a serious problem as in the United States, they are responsible for a considerable number of faults, and transmission engineers and manufacturers cannot afford to ignore this book.

Wireless Over Thirty Years, by R. N. VYVYAN. Pp. 256; 16 plates and 12 diagrams. London: George Routledge and Sons. Price: 8s. 6d.

In this book, Mr. Vyvyan, who was with the Marconi Company for about thirty years, for some time as chief engineer, describes the development of wireless telegraphy and telephony from the earliest times, explains present practice, and indicates likely lines of future development.

The work of the early pioneers is summarised in the first dozen pages, and the story really begins when Marconi arrives in England. The author joined the staff of the company soon afterwards in 1900. He was at once thrown into close contact with the work of the great inventor, and the account of those early days of the first transatlantic experiments, written as it is from the inside, makes the most fascinating reading. Then follows the better known story of the Imperial wireless chain, which never materialised owing to the war, the work of the committees and commissions which studied the same problem after the war, and the culmination in the remarkable success of the short-wave beam stations erected by the Marconi Company throughout the Empire. The author was in the thick of all this development, and he describes it in a most interesting manner.

Wireless signalling in the fighting services and in the merchant service is then considered, and some intriguing war experiences in the former, and rescue work in the latter, are described. The development of world-wide wireless telephony by the Post Office, and a summary of the growth of broadcasting are dealt with, and there is a most useful chapter on wireless as a career. There can be little about wireless as a career that is unknown to the author, and any parent with a son wishing to take up wireless engineering would be well advised to read this chapter carefully before making the book a present to his boy.

The author deals, in the main, with the growth of wireless signalling in this country, but that has been no small part of its development throughout the world, so that his book should interest wireless workers in other countries as well.

Electronics. By R. G. HUDSON. Pp. 135; figs. 45. London: Chapman & Hall. Price: 12s. 6d.

This book discusses some of the properties of matter in terms of the electrons and protons of which it is composed. It shows how the fundamental constants of these small particles, their electric charge, mass and size have been determined and describes their arrangement as the atom. The conduction of electricity is explained by the movement of electrons, and it is shown how this differs in gases, liquids, and solids. Thermic and photo-electric effects are described in similar terms. After a far too brief excursion into the quantum theory the working of various types of electric rectifier is explained, and this leads to a description of the way electronic movement is made to work talking-motion picture and television apparatus.

Discussion of such very special and topical devices does not fit too happily into a book otherwise devoted to so fundamental and universal a subject as the constitution of all matter. The book is clearly written, and practically avoids any mathematics beyond application of the rule of three. The non-physicist will find it interesting and eminently readable.

How true a picture of the nature of matter in its smallest particles can be given by so simple an exposition is, however, questionable. The reader is liable to gain the impression that electrons and protons obey the laws of classical mechanics far more than they actually do. He may come to believe that the Bohr model of the atom is really a model, whereas it is nothing of the sort. It is nothing, in fact, which could be reproduced by spheres moving round each other or even by any effort of the imagination. The author has certainly contrived to crowd a great deal of information into a small space.

Telephone Theory and Practice. Two Vols. (a) Manual Switching and Sub-station Equipment (pp. 440; figs. 327), and (b) Automatic Switching and Automatic Equipment (pp. 494; figs. 287). By Kempster B. Miller. London: McGraw-Hill. Price: 18s. per volume.

These volumes follow the first of a series, which was entitled "Theory and Elements." British telephone engineers in the past were indebted greatly to Mr. Miller, for his first book, "American Telephone Practice," published in 1904, contained a mass of valuable information not available elsewhere. Since then, however, telephone practice here has progressed on lines evolved by British engineers quite different from the equivalent in the States, and many innovations are purely British products and not merely adaptations of the systems described in Mr. Miller's latest volumes. We think therefore that he would have been well advised to retain the word "American" in his title. No mention is made of either the Siemens and Halske or the Swedish Ericsson systems, both of which possess features of interest and individuality.

Having ventilated this grievance, we have nothing but praise for Mr. Miller's work. The two volumes give a fairly complete and accurate description of American practice as it stood when the folios went to press, but so rapid is the progress in automatic telephony that it is scarcely possible to bring out a book that can be called right up-to-date. The subject is extremely intricate and only those engineers directly engaged in design and installation work can be expected to master all the details. Knowledge has spread widely, however, and books like those under review add vastly to the cumulative sum and give to even the expert a better perspective of the general position of the art. Mr. Miller's theory is sound, his descriptions lucid and his style interesting. For these reasons we recommend the volumes heartily to students and to engineers.

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Shorter Notices

"Télévision et Transmission des Images," by Réné Mesny. Paris: Collection Armand Colin. Price: 10f.50.

"Neon Tube Practice," by W. L. Schallreuter, Dr.Phil. (Pp. 132, illus.). London: Blandford Press. Price: 10s. 6d.

"Riddle of the Rates," by W. Ivor Jennings, M.A., LL.B. (53 pp.). London: *Local Government Chronicle*, 1s. net.—This booklet explains very clearly what the ratepayer gets for his money; it is a kind of a brief treatise on local government.

"The Agricultural Landowner's Handbook on Taxes, Rates, Tithe, Rentcharge and the Death Duties." Fourth edition. Pp. 208. London: Central Landowners' Association. Price: 5s. net.—This handbook was first published ten years ago, and in the present enlarged edition the whole of the subject matter has been revised and brought up to date. Of interest to electrical engineers is the section on electricity wayleaves.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

Popularising Electricity in Belgium

Under the patronage of the municipal council of Schaerbeek, a populous Brussels suburban area, a local committee has just held a successful "Electricity Fortnight." In addition to an exhibition of household electrical appliances a feature was made of popular addresses on electrical topics. To mention only a few, a member of the staff of the Philips Co. gave a lecture on "The Pleasures of Radio"; M. Uytborck, the general director of the Union des Exploitations Electriques en Belgique, spoke on "The Social Function of Electricity for the Middle Classes"; and the culinary expert of a Brussels evening paper on "Cooking by Electricity."

Increased Wages Asked For

The Manchester correspondent of the *Daily Herald* states that the employés' side of the Joint Industrial Council for the Electricity Supply Industry, North-Western Area, has presented an application for a general increase of 1d. per hour in the wages of about 8,000 workers in the industry. The claim is based on the prosperity of the industry, and reference is made to the "economy" cut of 2½ per cent. made in 1931, which in most cases has not been restored.

Italian Seaplanes use Exide Batteries

In the recent long-distance formation flights of the twenty-four Italian seapianes under the leadership of Air-Marshal Balbo, "Exide" batteries, type "5/XCM/9," in special containers with tappings at 6 to 10 volts, were used for radio and lighting.

Decca Company to Make Lamps?

The *Financial Times* is informed that the directors of the Decca Record Co. have under consideration the question of entering the electric lamp market.

Electrical Machinery Exports in July

In July the value of electrical machinery exported from the United Kingdom amounted to £235,983—£74,194 less than in July last year. The trade is analysed according to destination below:—

	Quantities.		Values.	
	July, 1933.	Inc. or dec. as compared with July, 1932.	July, 1933.	Inc. or dec. as compared with July, 1932.
	Tons.	Tons.	£	£
European countries	152	− 624	31,064	− 79,382
Japan	2	+ 1	597	+ 131
South America	117	− 7	24,628	+ 7,484
South and South-West Africa ...	322	+ 225	41,138	+ 23,387
British India	315	− 401	41,871	− 51,646
Australia	440	+ 400	55,006	+ 49,825
New Zealand	13	− 20	2,537	− 2,806
Canada	17	− 23	2,691	− 5,092
Other countries	246	− 130	36,451	− 16,095
Total	1,624	− 579	£235,983	− £74,194

It is gratifying to note that the improvement in trade with Australia still continues and that there was also a substantial advance in the shipments to South and South-West Africa. The position with regard to British India and Europe is less satisfactory, however. Our usual monthly table relating to electrical imports and exports generally appears on page 236.

Osram Lamp Factory Extensions

To cater for the growing demand for flash lamp bulbs, the Osram lamp factory at Wembley has recently been considerably extended. The building was originally built for the purpose of making pearl "Osram" lamps, but the opportunities offered by the flash lamp bulb market which until recently was dominated by foreign products were such as to make a change of plan advisable. Now the factory is supplying flash lamp bulbs in considerable quantities and excellent business is reported.

Pinchin, Johnson's New Offices

The new offices of Messrs. Pinchin, Johnson & Co., Ltd., at 4, Carlton Gardens, S.W., erected to house the administrative staffs of the company and its numerous associated concerns, was officially opened on Monday. The accommodation, which is of a most practical and up-to-date character, is incorporated in a simple and dignified building comprising a basement and nine floors. The most noticeable electrical features are "Magicoal" fires, pleasing lighting fittings, clocks, and the private telephone exchange with 160 extensions and a capacity of twenty exchange lines in addition to the company's seven private lines. At the opening ceremony the chairman of the company, Mr. Edward Robson, referred to the ill-informed criticism of the project, of which the architect, Sir Reginald Blomfield, gave a brief history, stating that the building had been completed within nine months of the laying of the foundation stone. Major Dove (chairman, Dove Bros., Ltd., the builders), and Messrs. C. G. Heywood and R. Paltridge (vice-chairman and managing director, respectively, of Pinchin, Johnson & Co.), also spoke.

Messrs. Pinchin, Johnson & Co.'s new headquarters.

Messrs. Rashleigh, Phipps & Co. were the electrical engineers, and electrical apparatus was supplied by the following firms: Clocks, Gillett & Johnson, Ltd.; fires, Berry's Electric, Ltd.; lighting fittings, Osler & Faraday, Ltd.; passenger lifts, Express Lift Co., Ltd.; goods hoist, Pickerings, Ltd.; fire appliances, Mather & Platt, Ltd.; and vacuum cleaners, British Vacuum Cleaner & Engineering Co., Ltd.

We are indebted to the *Architect and Building News* for the above picture.

Lamp Production in Portugal

According to a report published by an Amsterdam newspaper, the Portuguese Government has refused to grant permission to the Dutch Philips Lamp Company to establish a glow-lamp factory in Portugal.

Evasion of Customs Duties

At Dover on August 14th Noel Heys, a radio dealer, of Bolton, Lancs, was fined £200, with ten guineas costs, for

The "Osram" lamp works at Wembley have recently been extended by the addition of the portion to the left of the word "Osram" in the above picture

attempting to evade the Customs duties on imported radio apparatus. A solicitor appearing on behalf of the Crown stated that the sets in question were supplied by a Boulogne firm and shipped from Ostend. Special invoices had been used which did not disclose the true value of the goods. A Customs officer said that the defendant had admitted that he had been paying less than the correct amount of duty on imported radio apparatus.

Plastic Moulding Development

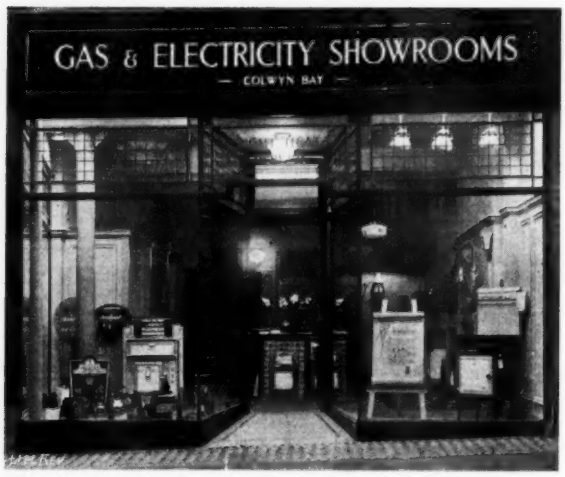
Arrangements have been completed between Croydon Mouldrite, Ltd., and Imperial Chemical Industries, Ltd., whereby the resources, experience and services of both organisations in the moulding powder and similar fields are now available to the plastics and allied trades through Croydon Mouldrite, Ltd.

German Glow-lamp Combination

A meeting was held recently at Weimar of the representatives of all the medium and small producers of glow lamps. As a result of the regulations issued by the Government, complete agreement was reached to form a combination for the mutual safeguarding of interests. About seventy firms are participating, most of which are located in Thuringia.

A Joint Enterprise at Colwyn Bay

After prolonged negotiations Colwyn Bay Electricity Department has at last been provided with showrooms in Penrhyn Road. Both the electricity and gas undertakings of the town



The new combined electricity and gas showrooms at Colwyn Bay

are municipally owned and the latter has successfully operated a showroom for some time past; the new premises will serve both undertakings. Terms have been arranged with local contractors enabling the Electricity Department to sell domestic apparatus on hire-purchase terms, and contractors are allowed to canvass on behalf of the Department, carrying out the installation work at scheduled rates: this agreement has been in operation successfully since March 31st. At the official opening of the showrooms Mr. J. V. Chaplin, the Council's electrical engineer, said that with the help of the local electrical contractors and the new showrooms he hoped to obtain both increased sales and a reduction in charges. He gave the assurance that there would be no cut-throat competition between the two departments in the showroom to the detriment of the consumers and ratepayers as a whole.

Irish Free State Electrical Imports

A fair degree of activity continues to prevail in the electrical trade in the Irish Free State, the imports of electrical machinery, fittings, and cognate apparatus attaining a value during June last of £63,444, as compared with £47,235 in June, 1932. The appended table gives details of the total imports during the first six months of the current year, and shows an increase of £39,225 or about 11¾ per cent.

	First Six Months. 1932.	1933.
	£	£
Electrical machinery	97,603	115,999
Electric wires and cables	52,236	35,797
Wireless sets and parts	93,131	101,614
Electric lighting accessories, fittings and parts ...	24,218	20,253
Other electrical goods	67,493	103,470
Copper wire	3,859	632
Total	£338,540	£377,765

An Electrically Operated Drop-pit

In order to provide facilities for effecting light running repairs at Bath locomotive depôt to the heaviest engines now running over the Somerset and Dorset Joint Line, the L.M.S. Railway is installing an electric wheel drop-pit, and a set of balancing tables for weighing locomotives after repair. Hydraulically operated wheel drops have been in use for many years at a number of L.M.S. engine sheds, but this is the first electrically operated one of this design to be installed on the system. The drop-pit obviates the necessity of lifting by sheer-legs engines whose axles require attention. The engine is placed over the drop-pit and the complete axle removed and lowered into the pit for attention, thus considerably speeding up repair operations.

Trade Announcements

The India Rubber, Gutta Percha & Telegraph Works Co., Ltd., has opened a new depôt for cables and wires at 10, Stanley Street, Liverpool, under the management of Mr. T. Mylchreest.

The Lancashire Electric Lamp Co., Ltd., has opened new stock rooms at 87, Islington, Liverpool, and asks for lists from manufacturers and agents of fittings and accessories.

Messrs. S. Eaton & Sons are opening new London showrooms at 16, Hatton Wall, E.C.1, under the supervision of Mr. P. M. Smith, who has been their London agent for the past ten years.

B.E.N. Patents, Ltd., have opened a sales and service depôt, at 45, Hardman Street, Liverpool, under the management of Mr. T. E. Scambler.

An Electric Motor Exhibition Car

On page 230 pictures appear of a car which has been touring the country for the purpose of exhibiting products of Lancashire Dynamo & Crypto, Ltd. Although it was, of course, impossible to include examples of all of the company's manufactures, it will be seen that there was a very wide selection, both of complete motors and component parts, as well as "Crypto" constant potential equipment and valve rectifier battery chargers. The company states that the interest shown in the exhibits was extremely gratifying.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price, August 16th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£8	—
a Sulphur Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3½d. to 3¾d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d.	—
METALS, ETC		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ... ,,	1/2 to 2/9	
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£195	£1 inc.
Grade II ... ... ,,	£134	£2 inc.
Grade III ... ... ,,	£66	—
c Brass (rolled metal 2" to 12" basis) per lb.	7¾d.	¼d. dec.
c ,, Tubes (solid drawn) ... ... ,,	9¼d. to 9½d.	—
c ,, Wire, basis ... ... ,,	7¾d.	¼d. dec.
c Copper Tubes (solid drawn) ... ... ,,	10¼d.	—
g ,, Bars (best selected) ... ... per ton	£68	—
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£42 10s.	—
d ,, ,, Sheets ... ,,	£64	—
d ,, ,, Wire Rods ... ,,	£47 10s.	10s. dec
d ,, ,, H.C. Wire ... per lb.	7 7/8d.	1/8d. dec.
f Ebonite Rod ... ... ,,	1/3 to 1/6	—
f ,, Sheet ... ... ,,	1/3 to 1/6	—
n German Silver Wire ... ... ,,	2/2	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	5¼d.	¼d. dec.
i Iron, Pig, (Cleveland No. 3) ... per ton	62/6	—
i ,, Wire, galv. No. 1, P.O. qual. ,,	£20	—
g Lead, English Pig ... ... ,,	£13 10s.	£1 5s. dec.
g Mercury ... ... per bot.	£8 10s. to £9 2s. 6d.	2/6 to 5/- dec.
e Mica (in original cases) small ... per lb.	6d. to 3/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	11d.	—
p ,, ,, rolled strip & sheet ,,	11d.	—
p ,, ,, wire ... ... ,,	1/0½d.	—
o Platinum ... ... per oz.	£7 15s.	—
d Silicium Bronze Wire ... ... per lb.	8½d.	⅛d. dec.
r Steel, magnet, in bars ... ... ,,	7¼d.	—
n Tin, Block (English) ... ... per ton	£215 to £217	£1 10s. inc
g ,, Wire, Nos. 1 to 16 ... ... per lb.	3/5	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. R. Dennis & Co.

New Electricity Offices and Showrooms

The Tamworth District Electric Supply Co., Ltd., proposes to erect new offices and showrooms on a site at Colehill, Tamworth.

Southend's New Showrooms

Continuing its campaign for building up the domestic load, Southend-on-Sea Electricity Department has just opened new showrooms at 171, Hamlet Court Road, Westcliff. The structure and decorative scheme generally of "Electric House,"

as the new building is called, lend themselves admirably to the demonstration of the latest methods of illumination; in particular a concealed lighting system shows to advantage the general showrooms with their oak-panelled walls and rounded roof shaded in pink and cream. All the latest domestic electrical appliances are on view, and upstairs there is a room where regular demonstrations of cooking and other apparatus are given. Features of a model bathroom are the illuminated full-length and shaving mirrors and the water-heating apparatus. Pictures of the showrooms appear on page 233.

A Cooker Display at Blackburn

Messrs. Moffats, the Canadian manufacturers of electrical equipment, are making progress in the subsidiary company formed to manufacture their cookers, etc., in Blackburn. They have converted the India Mill into a factory with ample room for extension, and this constitutes their European headquarters. Recently they have made a very effective exhibition at the Blackburn Corporation electricity showroom, and thousands of people in this busy thoroughfare have had their attention arrested when passing along the street. The firm have co-operated with Mr. W. A. Royle, the Blackburn Corporation electrical engineer, and a feature is made of the appeal to Blackburn electricity users to employ Blackburn-made equipment. The illustration gives some idea of the display.

Moffat display at Blackburn Corporation electricity showrooms

Paper Mill Power Plant

Last week we published an article (page 185) on the paper mill power plant of Messrs. Wiggins, Teape & Co. (1919), Ltd. We are informed by Messrs. Laurence, Scott & Electromotors, Ltd., that they were the main contractors for the whole of the motors (except the turbine plant auxiliary motors), cabling, switchboards and starters for not only this mill but also the electrification of the old mill at Dartford which is now in hand.

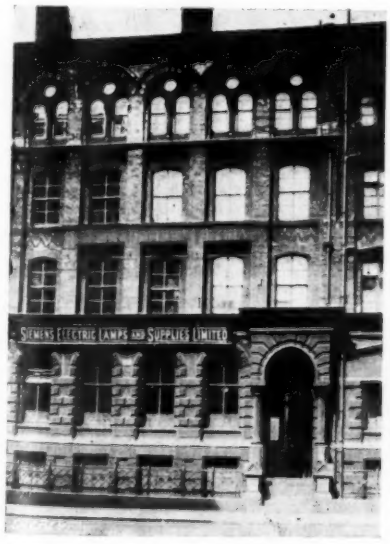
Recent Contract

The Great Western Railway Co. has placed a contract with the Westinghouse Brake & Saxby Signal Co., Ltd. for the installation of electric signalling at Ynyshir, near Pontypridd.

South Africa and Japanese Batteries

An exchange dumping duty has been imposed by the South African Government on electric batteries imported from Japan. The rate at which Japanese currency is computed in terms of South African currency for the purpose of assessing the dumping duty has been fixed at one yen, equal to 23.35d.

Siemens's New Leeds Branch



The new Leeds offices of Messrs. Siemens Electric Lamps and Supplies, Ltd.

Messrs. Siemens Electric Lamps & Supplies, Ltd., have moved their Leeds offices and stores from 129, Park Lane, to 54, Wellington Street, where new premises have been prepared containing larger office and stores accommodation, which enable more comprehensive stocks of goods to be held. Arrangements have also been made for extensive showrooms displaying modern lighting fittings, domestic electrical apparatus, telephone equipment and industrial electrical material. The telephone number as well as the telegraphic address remain unchanged.

For Sale

The Coventry Transport Department has for sale second-hand tramway plant, machinery and sundry materials. (See our classified advertisements.)

Social Events

The Clesco Sports and Social Club (County of London Electricity Supply Co., Ltd.) is holding its annual horticultural exhibition and garden party on August 26th at the company's sports ground, Raynes Park, S.W. In addition to the exhibition, there will be sports, an alfresco concert, dancing, and a firework display.

The officials and Cardiff office staff of the South Wales Electric Power Co. held their annual sports picnic at Caswell Bay, Gower, on Saturday last. This was arranged to coincide with and culminate the company's enterprising experiment of floodlighting the smaller bay for night bathing. The party, numbering about eighty members of the staff and their friends, included Mr. C. T. Allan, assistant manager of the company, and Mrs. Allan.

New Catalogues and Lists

L. Benn & Co., Ltd., Colonial Avenue, Minories, E.C.3.—A wholesale net price list of electric lamps and accessories.

Girlings, Ltd., Maldon, Essex.—Leaflets relating to "Mosaic" electric fires and grilling attachments.

Falk, Stadelmann & Co., Ltd., 83-93, Farringdon Road, E.C.1.—Leaflet No. P.1634, describing a new "Efesca" vacuum cleaner recently placed on the market.

Switchgear & Cowans, Ltd., Elsinore Road, Old Trafford, Manchester.—Catalogue section No. 26, showing typical installations of S. & C. switchgear and induction regulators.

C. Andrews, 49, Red Lion Street, High Holborn, W.C.1.—A brochure on the "Protexray" shock-free X-ray tube.

Renold & Coventry Chain Co., Ltd., Renold Works, Didsbury, Manchester.—A 155-page price list (No. 016/46), giving the new prices of Renold & Coventry products which came into force this month.

Venner Time Switches, Ltd., Kingston By-pass Road, New Malden.—A circular relating to master clocks for frequency control.

Donovan Electrical Co., Ltd., 46 and 47, Great Charles Street, Birmingham.—Leaflet No. 3381 describing isolating switches.

Marconiphone Co., Ltd., 210, Tottenham Court Road, W.1.—A large size folder containing the complete "Marconiphone" programme for the 1933-34 season.

Fuller Accumulator Co. (1926), Ltd., Woodland Works, Chadwell Heath, Essex.—A folder describing the full range of Fuller accumulators and batteries for radio and other purposes. Also leaflet No. DWA3 giving particulars of the new "M.D.G." cell.

Ferranti, Ltd., Hollinwood, Lancs.—A leaflet dealing with immersion heater units.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester.—A large number of leaflets for insertion in the company's sectionalised catalogue.

F. C. Heaybord & Co., 10, Finsbury Street, E.C.2.—A combined handbook and catalogue entitled "Mains Power for Your Radio."

Bankruptcy Proceedings

S. Simmons, electrical engineer, 189, Whalley New Road, Blackburn.—The public examination was held on August 9th at the County Court House, Blackburn, when the statement of affairs submitted disclosed a deficiency of £229. Debtor stated that at one time he was an engineer in South America and later a service telegraph foreman in British West Africa. Following an accident he returned to this country and commenced business on his own account in February, 1931. He had a commencing capital of £118 and had also used in the business £150 which he received in respect of his accident. The failure was attributed to sickness and bad trade. The examination was closed.

H. & S. Mozer, radio dealers, 111, High Street, Stoke Newington.—The statement of affairs filed shows liabilities of £1,046 (£981 unsecured) and no assets. The principal creditors are: British Ipso Battery Co., £53; Itonia, Ltd., £129; Marconiphone Co., Ltd., £70; Miss M. Mozer, £196; Zeitlin & Sons, Ltd., £117.

H. Cohen, radio dealer, 56, Cauley Road, Victoria Park, London, and recently carrying on business at 385, Mile End Road, E.—Receiving order made August 9th on a creditor's petition. First meeting August 22nd and public examination November 8th, both at Bankruptcy Buildings, Carey Street, W.C.2.

C. B. Greenhough, radio engineer, 56, Old Street, Ashton-under-Lyne.—First meeting August 18th at the Official Receiver's offices, Byrom Street, Manchester.—Public examination September 25th at the Town Hall, Ashton-under-Lyne.

C. E. Moore (trading as C. E. Moore & Co.), wireless engineer, 35, High Street, St. Neots.—First meeting August 18th at the Official Receiver's office, 41, Sidney Street, Cambridge. Public examination September 1st at the Law Courts, Peterborough.

F. D. Simpson, electrical engineer, 101, Cleveland Street, Doncaster, and recently 138, Cleveland Street.—First meeting August 18th at the Official Receiver's offices, Figtree Lane, Shef-

field. Public examination October 5th at the County Court Hall, Sheffield.

D. C. Brega (Brega's Radio Service), wireless and gramophone dealer, 305, King's Road, Chelsea.—Trustee, Mr. E. H. Hawkins, released July 14th.

W. Rowlands, wireless dealer, 56, High Street, Bethesda.—First and final dividend of 3½d. in the £, payable August 25th at the Official Receiver's office, St. Peter's Churchyard, The Cross, Chester.

A. E. Hilton, electrician, 104, Carolgate Bridge, Retford.—First and final dividend of 8s. in the £, payable August 9th at the Official Receiver's office, 1, St. Swithin's Square, Lincoln.

Company Liquidations

Vaco, Ltd.—Winding up voluntarily. Liquidator, Mr. R. H. Stevens, 37, Walbrook, London, E.C.4.

Albion Shades, Ltd.—Winding up voluntarily. Liquidator, Mr. E. B. Costello, Exchange House, Old Change, London, E.C.4.

Wanstead Electric, Ltd.—Meetings September 11th at the offices of Messrs. E. W. Longhurst & Co., 73, Basinghall Street, London, E.C.2, to receive an account of the winding up by the liquidator, Mr. E. W. Longhurst.

Chelmsford Radio, Ltd.—Meeting August 18th at 42, Duke Street, Chelmsford, to receive an account of the winding up by the liquidator, Mr. C. S. Polkinghorne.

Hillbar Press, Ltd., battery case manufacturers, &c., Forest Rise, Whipps Cross, E.17.—The statutory meeting of creditors was held on August 10th at Anderton's Hotel, London, E.C.4. A statement of affairs was submitted which showed ranking liabilities of £2,719 and assets estimated to realise £1,602, subject to preferential claims of £193, and debentures of £846. The net assets, therefore, were £563, leaving a deficiency so far as the creditors were concerned of £2,157. About two years ago an action was commenced against the company for an injunction and damages in respect of certain cartons for the wireless trade. That action had been pending ever since, and in the circumstances it has not been possible to get people to introduce money into the company. In July a writ was issued by a creditor and later the debenture-holders appointed Mr. Shepherd as receiver. A resolution was passed confirming the voluntary liquidation of the company, with Mr. Shepherd and Mr. A. Willmott, of Messrs. Francis, Nicholls, White and Co., Cheapside, E.C., as joint liquidators.

The car which has recently been touring the country displaying products of Lancashire Dynamo & Crypto, Ltd. (See page 228)

Private Arrangement

E. A. Davies (trading as J. H. Winter & Co.), electrical engineer, 73, Park Street, Bristol.—A meeting of creditors was held recently at Bristol, when a statement of affairs was submitted which disclosed liabilities of £2,409, of which £1,714 was due to the trade. The assets were estimated to produce £1,769, from which had to be deducted preferential claims of £224, leaving net assets of £1,545, or a deficiency of £863. It was resolved that the debtor should execute a deed of assignment in favour of Mr. Arthur Collins, Bristol, as trustee. A committee of inspection was also appointed. The creditors include: Brunwec, Ltd., £112; Callender's Cable & Construction Co., Ltd., £50; Electrical Components, Ltd., £72; Foster Engineering Co., Ltd., £62; Gardner & Co., Ltd., £51; General Electric Co., Ltd., £192; Siemens Electric Lamps & Supplies, Ltd., £72.

Dissolution of Partnerships

Electric Trading Co.—Messrs. T. W. Croft and F. C. Lowe, electrical and wireless dealers, 46, Lune Street, Preston, have dissolved partnership. Mr. Croft will attend to debts and carry on the business.

Wellers.—Messrs. J. O. W. Fellows and H. F. Askew, general and wireless engineers, 184a, London Road, East Grinstead, have dissolved partnership and will deal jointly with debts contracted before July 31st. Mr. Askew will continue the business.

Kenfig Hill Radio Relay.—Messrs. S. Waters and J. S. Enos, wireless relay operators, 82, Pisgah Street, Kenfig Hill, have dissolved partnership. Mr. Waters will carry on the business.

Meeting of Creditors

F. J. Jones & Co., Ltd.—A meeting of creditors will be held at the Stafford Hotel, City Road, Chester, to-morrow, August 19th.

Electricity Supply

Lighting, Domestic, Power

Auckland.—PURCHASE OFFER DECLINED.—The Rural District Council has refused an offer from the North-Eastern Electric Supply Co., Ltd., to purchase the electrical undertaking at Witton-le-Wear.

Barrow-in-Furness.—SUPPLY EXTENSIONS.—The Ministry of Transport has consented to the Corporation using overhead lines for a supply of electricity to Urswick, Colton, Blawith, Lowick, and between Sparkbridge and Water Yeat, in the Crake Valley.

Batley.—HIRE-PURCHASE SYSTEM.—The Town Council has adopted a system of hire-purchase of electrical appliances in connection with the recently instituted domestic tariff.

Bournemouth.—LOWER CHARGES.—The Bournemouth & Poole Electricity Supply Co., Ltd., has reduced the flat rate for lighting for the supply to Kinson and Canford Magna from 8d. to 6d. per kWh, and the two-part tariff running charge from 1½d. to 1d.

Canada.—EXPORT OF POWER TO U.S.A.—Our Toronto correspondent reports that the export of electrical power to the United States amounted to 86,673,000 kWh in June, as compared with May's total of 42,673,000 kWh and 35,272,000 kWh in April. A slight increase was recorded in the production of electrical energy for the month, which amounted to 1,371 million kWh, as compared with 1,350 million kWh in May and 1,295 million kWh in April.

Cardiff.—NEW SUB-STATION.—The Electricity Committee is to erect a sub-station in Thornhill Road (£1,383).

Caterham.—SPECIAL ORDER.—The County of London Electric Supply Co., Ltd., is to apply to the Electricity Commissioners for a Special Order authorising the purchase of the Caterham and Woldingham undertakings of the Urban Electric Supply Co., Ltd.

Cheadle and Gatley.—REVISED CHARGES.—The Urban District Council has revised the charge for heating and cooking from 1d. per kWh all the year round to 1½d. per kWh for the winter quarters and 1d. for the summer quarters in the urban district; in the outside area the charges are to be 1¾d. in the winter and 1¼d. in the summer. There has also been a reduction in the lighting rate from 5d. to 4¾d. per kWh in the urban district, and from 6d. to 5¾d. in the outside area. The fixed charge of the all-in tariff has been altered, with a standard flat rate of ¾d. per kWh all the year round.

Cheltenham.—REDUCED CHARGES.—The Town Council has adopted the following revised scale of charges in the rural area: Flat lighting rate reduced to 6d. per kWh; power charge from 1½d. to 1¼d.; and hire of wash-boilers from 3s. per quarter to 2s.

Douglas (I.O.M.).—REDUCED TARIFFS.—The Electricity Committee has reduced the flat rate for lighting from 7d. to 6¾d. per kWh for the first 2,000 kWh, and 5¾d. per kWh thereafter. The flat rate for power is to be 2d. per kWh for the first 3,500 kWh and 1½d. per kWh for all energy in excess of this amount; all rates are subject to discount.

Dumfriesshire.—The County Council's electricity scheme is making rapid progress. Supplies were made available last week for the first time in Moniaive and Thornhill.

Great Yarmouth.—NEW TRANSFORMERS.—The electrical engineer reports that, in order to meet the requirements of the Central Electricity Board with regard to a duplicate connection to the grid, it will be necessary to install new transformer plant at the electricity works, and the Electricity Committee has decided to apply for sanction to a loan of £5,989 for the purpose.

Hawarden.—SUPPLY TO MOLD.—The Rural District Council has commenced a supply of electricity at Mold. The scheme was inaugurated by the chairman of the Urban District Council, Mr. A. Powell, J.P., the arrangements being supervised by Mr. Arthur Richardson, chief electrical engineer.

Hebden Bridge.—INCREASED OUTPUT.—The electrical engineer and manager, Mr. H. H. Sutcliffe, reports that the output during the months of June and July showed increases of 20 per cent. and 44 per cent. respectively over the corresponding months of last year.

Hoylake.—EXTENSION OF SUPPLY AREA.—The U.D.C. has applied to the Electricity Commissioners for an Order extending its area of supply so as to include the several areas added to the urban district.

Ipswich.—NEW SUB-STATIONS.—The Electricity Committee has purchased sites for three sub-stations in Woodbridge Road, Foxhall Road, and Barrack Lane.

Italy.—OUTPUT OF ELECTRICITY.—According to *L'Energia Elettrica*, the capacity of the electric power stations in Italy at the end of May last amounted to 4,510,000 kW, as compared with 4,436,000 kW at the corresponding date a year ago, an increase of 6.7 per cent. Of the total, hydro-electric plants were responsible for 3,712,000 kW, and thermal and internal-combustion-engined stations for 798,000 kW. The output of electricity in Italy during the five months ended with May last is estimated to have amounted to 4,278,744,000 kWh, as compared with 3,928,752,000 kWh in the similar period of 1932, an increase of 8.91 per cent. Of the total, hydro-electric stations are credited with 4,157,237,000 kWh, and steam- and internal-combustion-engine stations with 121,507,000 kWh.

Littlehampton.—REVISED TARIFF.—The Sussex Electricity Supply Co., Ltd., has adopted the following revised tariff:—Domestic all-in: small fixed quarterly charge with an allowance of one kWh per shilling of the charge, plus 1d. per kWh for the first 240 kWh per quarter and ¾d. beyond, with no meter rent. Commercial tariff: lighting, 6d. per kWh, less discounts ranging from 10 to 20 per cent.; heating and cooking, first 2,400 kWh per quarter 1d. per kWh, beyond ¾d. Advertising tariff: 3d. per kWh; lighting from 9d. to 6d. per kWh (as compared with 1s. to 9d. previously), with minimum charges of 12s. (winter quarters) and 9s. (summer quarters), against 15s. and 10s. respectively. Heating and small power tariff: 2d. per kWh, instead of from 6d. to 3½d.

Manchester.—PROGRESS DURING JUNE.—The monthly report for June of the Electricity Department shows an increase of 838 in connections, making a total of 90,461. There were 1,709 applications for supplies (including additional supplies) against 2,155 during May. Orders received for new cookers amounted to 154 and 140 new ones were connected, bringing the total on circuit up to 11,570. The corresponding figures for wash-boilers were 25, 20, and 464 respectively.

Nantwich.—SUPPLY EXTENSIONS.—The Electricity Distribution Company has informed the Rural District Council of its intention to extend its supply of electricity to Hough Village and Audlem.

Oban.—LOAN.—The Town Council has agreed to borrow £28,477 for its electricity scheme. The scheme has been in progress for the past six months and is expected to be completed within the next few days. A new generating station has been built and additional cables have been laid.

Perth.—REDUCED STREET-LIGHTING CHARGE.—It is proposed to reduce the public lighting flat rate from 1d. to ¾d. per kWh.

Preston.—MAINS EXTENSION.—The Electricity Department has decided to extend the electric cable north of Garstang to Cabus.

Richmond (Yorks.).—REDUCED CHARGE.—On the recommendation of the Electricity Committee, the Town Council has agreed to reduce the price of electricity for public lighting from 4d. to 3d. per kWh as from April 1st, 1933.

Saffron Walden.—ELECTRICITY UNDERTAKING SOLD.—Faced with the prospect of making improvements to its electricity supply undertaking at a cost of nearly £10,000, the Town Council has sold it to the County of London Electric Supply Co., the latter becoming responsible for the net loans outstanding in respect of works, which amount to £12,562. In addition, the company is paying £1,500 as compensation for loss of employment to certain officials, and is to defray all costs in connection with the proposed change-over from d.c. to a.c. supply.

Southgate.—ELECTRICITY FOR COUNCIL HOUSES.—The Housing Committee reports that it has now settled with the North Metropolitan Electric Power Supply Co. an agreement which will permit the company to supply electricity to tenants of the Council's houses. The agreement provides that where an electrical installation is provided the gas fittings must be disconnected, and that the charge for the supply of electricity shall be as follows, subject to any alteration made by the company in the charges for the supply through prepayment meters to other houses in the district: either (*a*) a fixed charge of 1s. 9d. per house per week, with an additional charge of 1d. per kWh for all electricity consumed, less a rebate of ¼d. per kWh during the summer, or (*b*) a fixed charge of 1s. 7d. per house per week, with an additional charge of 1d. per kWh for all electricity consumed.

Spalding.—PURCHASE OFFERS REJECTED.—The Urban District Council has received additional offers for the purchase of the electricity undertaking, but all of these have been rejected.

LOANS.—Loans of £1,500 for extensions to Moulton and £1,250 for the Pinchbeck West extension have been applied for, and the Council has received sanction to a loan of £3,000 for a new h.p. line from the Surfleet sub-station to Spalding.

Steyning.—SUPPLY TO CODMORE HILL.—The Steyning Electric Light Co. has been requested to afford a supply of electricity to the Codmore Hill area without further delay.

Tynemouth.—REDUCED CHARGES FOR HIRED COOKERS.—The Electricity Committee has decided to reduce the rentals for electric cookers hired out at present.

Uttoxeter.—LOAN.—The Electricity Commissioners have informed the Urban Council that they will sanction a loan of £1,600 immediately the Minister of Transport consents to the erection of overhead lines in connection with the proposed scheme.

Werrington.—ELECTRICITY SCHEME.—A scheme for providing electricity to Werrington Bridge is to be proceeded with.

West Sussex.—APPLICATIONS FOR ELECTRICITY.—The County Council Small Holdings Committee has decided that any future applications from tenants to have their cottages wired for electricity shall be granted subject to their agreeing to pay an increased rent on the basis of £1 per annum for every £6 expended by the County Council.

Whitehaven.—LOAN.—The Town Council has applied for sanction to a loan of £750 for erecting an overhead 11-kV line to Thurnam and High Low Hall Farm, and providing transformers and switchgear.

SUPPLY DELAYED.—The Rural District Council has been informed by the Mid-Cumberland Electricity Co. that there will not be a supply of electricity available for Lowca until next year. In consequence, the Council has asked the United Steel Co. to renew its contract for street lighting.

Traction

Austria.—NEGOTIATIONS WITH HUNGARY.—Negotiations are proceeding between Austria and Hungary for the electrification of the railway between Vienna and the Hungarian frontier and are expected to be concluded next month. The expenditure is estimated at from 12 to 14 million sch. The construction of electric locomotives for the line is not being undertaken at present by Austria, as it is proposed to use existing Hungarian locomotives. If the question is satisfactorily settled, it is reported that tenders will be invited in the winter for the execution of the work, provided that the provision of the necessary capital is assured.

Australia.—MELBOURNE TRAMWAYS.—It is expected that the revenue of the Melbourne Tramways Board for the year ended June 30th will show an increase of £15,000 on the preceding year. The receipts for the year ended June 30th, 1932, were £144,000 less than those of the previous financial year.

BALLARAT AND BENDIGO TRAMWAYS.—It is anticipated that the sub-committee of the Victoria Cabinet which is investigating the position of the Ballarat and Bendigo tramways will recommend that the State Treasury and the Electricity Commission should make a joint application to the Unemployment Council for a grant of £170,000 for the reconstruction of the

Folkestone bandstand is a brilliant spectacle illuminated by Beeantee equipment

tramway tracks. A recent application from the Electricity Commission was deferred. The Cabinet sub-committee is also investigating plans for the future control of the tramways in Ballarat, Bendigo, and Geelong.

Belgium.—ELECTRIC LOCOMOTIVE CONTRACT.—The Technical Committee of the Belgian State Railway Exploitation Company has submitted a scheme to the Executive Board for the placing of orders for twenty-four electric locomotives for use on the Brussels-Antwerp line when this is electrified. The contract is being divided between Ateliers de Constructions Electriques de Charleroi, the Société d'Electricité et Mécanique, of Ghent, and the Société de Constructions Elec-

triques Belges, of Liège. These locomotives will be brought into use in April, 1935, and will reduce the time taken for the journey to half an hour.

Bolton.—THROUGH SERVICE TO LEIGH.—The Tramway Committee has approved a suggestion by the South Lancashire Transport Co. for a through trolley-bus service between Bolton and Leigh.

France.—NEW PARIS RAILWAY.—A sum of £10,000 is to be spent in constructing an electric rack railway up the steep slope of Montmartre to the Sacré Coeur Basilica. The original cable-operated route was abandoned in 1931 in favour of motor buses, which travelled by a round-about way.

NEW ELECTRIC LOCOMOTIVE.—The P.L.M. Railway Co. has just completed tests on a new Diesel-electric locomotive, which has covered the journey of 536 miles between Marseilles and Paris at an average speed of 62 m.p.h. without refuelling and drawing a full complement of carriages.

Italy.—MILAN UNDERGROUND RAILWAY.—The plan of the Commune of Milan for the construction of an underground railway has been approved by the Higher Council of Public Works at Rome. The scheme, which will take about four years to complete, will cost about £3,000,000 and will consist of five radial lines linking towns up to twenty miles away from the city.

Japan.—NEW ELECTRIC RAILWAY IN TOKYO.—The new 12-km. electrified line from Shibuya to Kichijoshi was opened on August 1st.

Macclesfield.—TRAFFIC SIGNALS.—The Corporation is to erect vehicle-operated traffic signals at Chestergate junction (£996).

New Zealand.—RAILWAY ELECTRIFICATION.—The Government proposes to electrify the new railway line out of Wellington at a cost of £277,000.

St. Helens (Lancs.).—TROLLEY-BUSES TO REPLACE TRAMS.—The Town Council is to take steps to obtain a Provisional Order authorising the institution of trolley-bus services on tram routes at Dentons Green, St. Helens Junction, and Prescot.

Sweden.—PRIVATE RAILWAY ELECTRIFICATION.—It has been decided to electrify the Bergslagernas Railway, the largest private line in Scandinavia, from Gothenburg to Mellerund, a distance of seventy-seven miles, while the Dalstand Railway line from Mellerund to Kornsjo (forty miles) on the Norwegian frontier is also to be electrified. The electrification of the so-called southern trunk line is progressing rapidly, says *Reuter's Trade Service* (Stockholm), and in October next electric trains will be running from Stockholm to Malmö. On the Stockholm-Alvesta and Malmö-Esloev sections trains are already electrically driven, and the electrification of the whole line will be completed about six months earlier than expected. Work on the electrification of the Stockholm-Aange line is being continued, and in a few months the conversion of the West Coast line, running from Gothenburg to Malmö will begin.

Communications

Australia.—MORE WIRELESS LICENCES.—The total number of wireless licences issued in Australia by June 30th was 469,477. This figure shows an increase of 99,532 over the previous year. —*Reuter*, Sydney.

Belgian Congo.—BROADCASTING TESTS.—Proposals to set up a broadcasting service are being considered by the Belgian Ministry of Colonies. Tests have shown that transmissions on 29.04 metres with 9 kW power from the Ruysselede station, the programme originating at Brussels, were received in the Congo at good strength without distortion and little fading. Trial radiation has also taken place under similar conditions from the Leopoldville station at the capital of the Congo.

NEW TELEPHONE LINE COMPLETED.—A new telegraph line has lately been completed and put into operation between Mobaye and Fouroumbala.

Canada.—RADIO LICENCES.—During the year ended March 31st, 1933, the number of receiving licences issued totalled 761,288, or one in fourteen of the population, an increase of 163,030 on the previous year's total.

China.—RADIO STATION LICENCES.—Discussions now in progress among the authorities of the International Settlement, French Concession, and Greater Shanghai, relating to the central control of wireless stations, lend interest to the publication by the French Municipality of additional regulations, under which a scale of licence fees has been fixed for stations in the Concession broadcasting speech or music. The municipal administration will assign wavelengths, and precautions will be taken to prevent interference, says *World-Radio*. Stations are forbidden to disseminate political propaganda, or to broadcast news calculated to cause public disturbance.

Germany.—WORLD-WIDE BROADCASTING.—Herr Hadamowsky, who is in charge of broadcasting in Germany, has just concluded a tour of the various stations, and announces that on May 1st next year every German national, from New Zealand to Chicago, will be brought into touch, through broadcasting, with the Fatherland.—*Reuter*.

AUTOMATIC TELEPHONE'S BIRTHDAY. — The twenty-fifth anniversay of the introduction of automatic telephony into Germany was celebrated recently. The first auto-exchange was installed at Hildesheim in July, 1908. It is claimed that to-day 75 per cent. of the country's two million subscribers are served by automatic exchanges.

Great Britain.—RADIO RELAY SERVICES.—Chesterfield Highways Committee has decided to take no action with regard to a further application from Rediffusion, Ltd., for permission to operate a radio relay service in the town.

Blackpool Highways Committee has granted Radio Relays, Ltd., permission for twelve months to place wires across streets.

Chelmsford Town Council has accepted the offer of Christy Bros. & Co., Ltd., to operate a service on a ten years' agreement.

Northampton General Purposes Committee reports in favour of an agreement with Messrs. Turner and Smeathers as agents for a proposed local company for the right to operate a system for five years and thereafter subject to twelve months' notice.

York Housing Committee has given permission to the York Relay Co. to fix a second wire for an alternative programme to the backs of council houses, and recommends an extension of the agreement with the company for a further five years on the same terms and conditions.

WIRELESS RECEIVING LICENCES.—During July 215,000 licences were issued by the Post Office, making a total of 5,626,000 after allowing for renewals.

India.—PROGRESS OF BROADCASTING.—India's broadcasting service is now six years old. Receiving licences increased from 3,000 in 1928 to 7,600 in 1930 and to 10,000 in 1933, yet the country's population is about 350 millions. When presiding at the sixth anniversary ceremony, Sir Frederick Sykes, Governor of Bombay, declared that they would "do well to follow the English pattern" in their development.—*Reuter*.

LONDON-KARACHI TELEPHONE SERVICE.—*The Times* Karachi correspondent says that it is expected that Karachi will be connected by beam wireless telephony with London on September 1st. It was stated last week that the officials of the General Post Office were in communication with the authorities in India about the extension of the wireless telephone service to various towns in India, but that at present they had no definite information of the date when the service would be opened to Karachi. The difficulty, it was stated, was in the matter of land lines. The wireless telephone service could not be extended to certain towns in India until satisfactory land lines were available to carry the conversations so that they could be transmitted over the wireless link between Bombay and London. Extensions to various important towns not at present joined up would be effected as soon as communications between them and Bombay were able to carry the transmissions.

RADIO PIRACY.—A message from Bombay says that for the suppression of radio "piracy" in India the Government of India is introducing a Bill in the next session of the Legislative Assembly. Piracy is most rampant in towns and cities, and it is estimated that, though the number of licencees is about 10,000 in the whole of India, the actual number of listeners-in is nearly 25,000.

Italy.—MICRO-WAVE RADIO.—Speaking before the scientific section of the Italian Royal Academy on Monday, Marchese Marconi said that this month he had been able to make further trials in telegraphic and telephonic radio transmission by means of micro-waves of about 60 cm. The tests were between transmitting apparatus at Santa Margherita Ligura (near Genoa) and the yacht *Elettra*, which moved along the coast. Though the distance over which one would expect reception was only 30 km., the transmissions were received on the yacht with great force and regularity at a range of 150 km. Last year the greatest distance over which reception could be effected was only 52 km. Feeble Morse signals were perceptible as far as Port Santo Stefano, a distance of 258 km. High mountains intervened between the two posts. The better results appeared to be due to the improved efficiency of the transmitting and receiving apparatus and of the reflectors used.

London.—POLICE RADIO.—The London police force is to have more motor cars. Many of the several hundred vehicles at present in use are equipped for wireless communication. This service is to be augmented in the near future and will necessitate the training of more operators and the purchase of mobile radio equipment.

Somerset.—WEST NATIONAL STATION.—The new West National transmitter began a full service on August 13th on a wavelength of 261.6 metres, 1,147 kc/s. The station radiates the West Regional programme on a wavelength of 309.9 metres, 968 kc/s.

Southern Railway.—On Wednesday last the Southern Railway ran a special sightseeing excursion between Brighton and Chichester, a special feature of the trip being that power amplification equipment was installed on the train by the Brighton & Preston Relay Station, Ltd. The equipment consisted of thirty loud speakers and a microphone through which a running commentary on the historical and other points of interest was given throughout the trip.

Turkey.—TELEPHONE DEVELOPMENT.—During the current year direct telephone communication is to be established between Izmir (Smyrna) and Istambul and between Izmir and Ankara. Two more telephone lines are also to be set up between Ankara and Istambul. A five-year plan is stated to be in course of preparation under which all the large towns of Turkey will be placed in communication with each other.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—Posts and Telegraphs Department. September 26th. Telephone receivers and parts. (A.Y. 11916.)* October 3rd. Telephone cord tags and connection plates. (A.Y. 11917.)*

Boston.—August 22nd. Corporation. Electrically driven centrifugal sewage pumps. Borough surveyor (deposit £5).

Egypt.—CAIRO.—September 11th. Controller of Technical, Industrial and Commercial Education. Mechanical and electrical equipment for the Abbassia Technical School. (A.Y. 11879.)*

Glasgow.—August 28th. Corporation. Electric lighting installation at the Fish Market. General manager, Electricity Department, 75, Waterloo Street, Glasgow (deposit £1 1s.).

Kettering.—August 23rd. Urban District Council. Work and equipment in connection with the bulk supply to the works of Messrs. Stewarts & Lloyds, Ltd., at Corby. (August 4th.) August 28th. 2,000-kVA transformer. (August 4th.)

Leyton.—September 4th. Town Council. Lighting and electrical equipment at Public Baths, High Road. (See this issue.)

London.—HAMMERSMITH.—August 21st. Electricity Department. Wiring of blocks of tenements. (August 11th.)

Middlesbrough.—September 4th. Three sets of traffic signals. (August 11th.)

New Zealand.—WELLINGTON.—October 24th. Public Works Department. Four 3,333-kVA. 110-kV transformers. (A.Y. 11936.)*

Plymouth.—August 26th. Corporation. Electricians' sundries, lamps, conduit, cable, &c., as required by the various departments. Mr. R. J. Fittall, town clerk.

Shipley.—August 25th. Electricity Department. Two 250-kVA transformers and/or automatic voltage regulators. (August 4th.)

South Africa.—PRETORIA.—September 1st. Government Supplies Board. Post Office detectors. (A. 11926.)*

CAPETOWN.—September 13th. Electricity Department. Thirty-two three-phase transformers. (A.Y. 11931.)*

Sunderland.—September 4th. Electricity Department. Paper-insulated cable, rubber-insulated wire, meters and lamps. (August 4th.)

Thame.—August 25th. Urban District Council. Electrically driven centrifugal pumps for sewage works. Engineer and surveyor, Town Hall.

Turkey.—ANKARA.—September 24th. Administration of Posts, Telegraphs and Telephones. 7,000 metres of submarine telephone and telegraph cable and accessories. (A.Y. 11935.)*

Warrington.—September 4th. Electricity Department. Cables, earthenware conduits, and concrete slabs and tiles. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Colchester.—Electricity Committee. Accepted. 3,000-kVA transformer (£783).—Metropolitan-Vickers Electrical Co., Ltd.; switchgear, &c. (£452).—Electric Construction Co., Ltd.

Dagenham.—Urban District Council. Accepted. Installation of traffic-actuated signals (£175).—Automatic Electric Co., Ltd.

Dartford.—Electricity Committee. Recommended. Cooker wiring for six months.—W. J. Bayliss.

Ipswich.—Electricity Committee. Recommended. Testing equipment (£123).—Ferranti, Ltd.

Morecambe.—Electricity Committee. Accepted. Cables.—Derby Cables, Ltd.

Nottinghamshire.—Highways Committee. Recommended. Automatic traffic signals at East Retford (£364).—Automatic Electric Co., Ltd.

Peterborough.—City Council. Accepted. Electricity showrooms at municipal buildings. Wiring (£183), main switch and control board (£39).—Grierson, Ltd. Main lighting, lighting for display purposes and illuminated sign (£305).—Edison Swan Electric Co., Ltd.

Reigate.—Town Council. Accepted. Electrical installation for lighting, heating and bells at the electricity showrooms at Redhill (£85).—G. E. Thomas & Co.

Rugby.—Town Council. Accepted. Wiring 100 houses for electric lighting (£517).—Rugby Electrical Engineering Co.

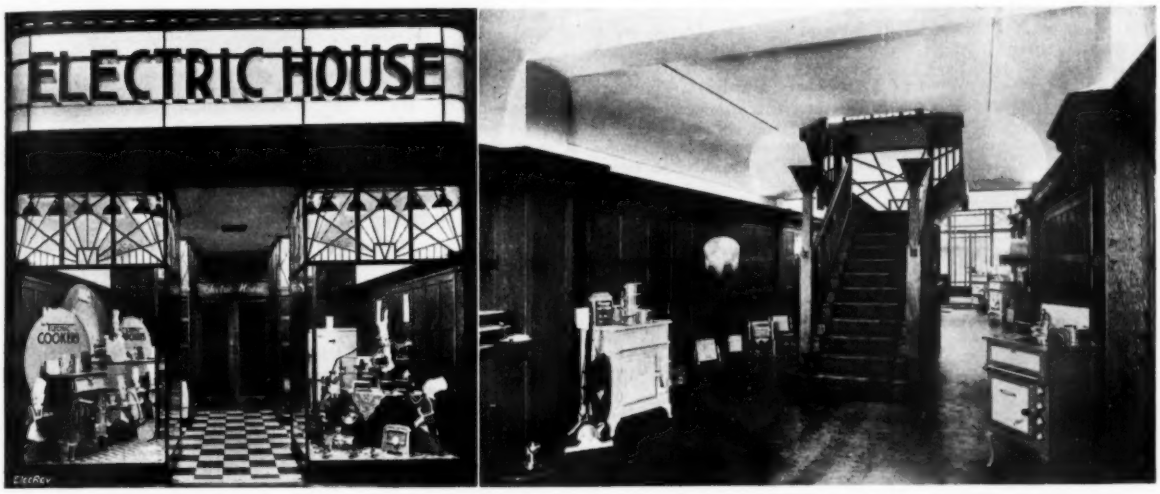
Southport.—Education Committee. Accepted. Installation of electric lighting at Farnborough Road school (£377).—F. W. Smith.

Spalding.—Urban District Council. Accepted. Regulator, £451 (less £120 for existing regulator).—Ferranti, Ltd. Kiosk (£174).—Lucy & Co. Overhead line (£1,875).—Segmental Wire Corporation. Special switch on grid supply at Surfleet (£206).—A. Reyrolle & Co., Ltd.

Tynemouth.—Town Council. Cable (£352).—Macintosh Cable Co., Ltd.

West Sussex.—Assistance Committee. Accepted. Electrolux water-softening plant at Midhurst institution (£167).—Midhurst Engineering Co., Ltd. X-ray plant (£658).—Cuthbert Andrews. Ortho-screening stand (£150).—Dean & Co.

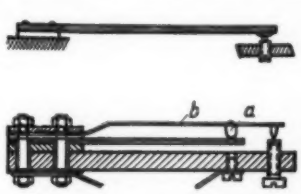
Whitehaven.—Town Council. Accepted. Supply, erection and connecting up of e.h.p. kiosk, switchgear and transformer for the Loop Road (North) extension (£260).—Macintosh Cable Co., Ltd.



Exterior and interior views of the new showrooms of Southend-on-Sea Electricity Department (See page 228)

Improved Thermostatic Regulator

THE simplest form of bimetal regulator, consisting of a bimetallic strip controlling a make-and-break contact, is liable to be operated repeatedly and unnecessarily by heat developed at the contacts. According to a paper by Dr. A. C. Wiese in *Elektrotechnische Zeitschrift*, the circuit may thus be interrupted from 10 up to 50,000 or more times a minute, instead of only once in seven to ten minutes as would normally suffice to maintain constant temperature in a hot-cupboard or similar equipment. Measurements confirm that rapid periodic variations in temperature up to about 5 deg. C. occur at the end of the strip near the contact when the arrangement is as shown in the upper illustration herewith. Once the incorrect action of the thermostat is started by such local heating, it is liable to become cumulative in degree. The excessive heating of the strip, and the premature and too-frequent opening of the contacts result in the maintenance of lower than the desired temperature in the hot box or other space controlled. Also, the high-frequency interruption of the regulator contacts may result in serious interference with radio reception.



Improved thermostatic regulator

All these objections are eliminated by the improved arrangement shown in the lower illustration, the special feature of which is the separation of the contacts from the bimetal regulator strip. The latter bears on an insulating stud *a* attached to the current-carrying strip *b*, which has a pointed contact resting on the adjustable fixed contact. The pointed contact presents so small an area to the switching spark that there is no danger of vibration being started mechanically; and, as the stud *a* is a thermal as well as an electrical insulator, the temperature of the bimetal strip is unaffected by heating of the contacts. Tests with this device show that it effects none but the make-and-breaks required to maintain constant temperature in the space controlled.

Notes

Generation of Electricity in July

The official returns rendered to the Electricity Commissioners show that 913 million kWh was generated by authorised undertakers in Great Britain during the month of July, as compared with the revised figure of 807 million kWh in the corresponding month of 1932, representing an increase of 106 million kWh or 13.1 per cent. The number of working days in the month (*i.e.*, excluding Sundays) was twenty-six, the same as last year.

During the first seven months of 1933 up to the end of July the total amount of electricity generated by authorised undertakers was 7,401 million kWh, as compared with the revised figure of 6,902 million kWh for the corresponding period of 1932, representing an increase of 499 million kWh, or 7.2 per cent.

An Illumination Convention

The Illuminating Engineering Society (U.S.A.) will hold its twenty-seventh annual convention at Lake Delavan, Wisconin, from August 28th to 31st, and will spend September 1st at the "Century of Progress" Exhibition in Chicago. The agenda includes twenty-five papers on the technical and commercial aspects of artificial lighting but no paper specifically devoted to gaseous discharge lamps.

New Type of Three-core Cable

The ordinary sector-type three-core cable effects a large saving in worming material, and a considerable reduction in overall dimensions compared with three circular cores and a circular sheath. It involves, however, a relatively heavy expenditure on core insulation. The T-SO cable, a new construction introduced by H. Sonnenfeld, reduces dead space and amount of insulation to the minimum by combining sector cores with triangular belt insulation and sheathing as shown in fig. 1, from *Elektrotechnische Zeitschrift*. The central angles of the sector cores are 120 deg. as usual, but the outer angles are each 90 deg., and by varying the ratio b/a in fig. 2, which shows the theoretical form of the core, it is possible to arrive at the most economical shape for a given conductor section with stated prices of raw material.

Fig. 1

This problem is dealt with by Dr. L. Tschiassny, *loc. cit.* If the outer circumference ABCDE of the core = U_A; and the total circumference ABCDEMA = U_G, then the variation of U_A, U_G, with the ratio $k = b/a$ is as shown by fig. 3, where Q = full area of the core shape without rounded corners. The cost of the belt insulation is a minimum when $k = l$, and that of the conductor insulation when $k = 0.634$. The optimum value of k, for minimum total amount of material, the conductor

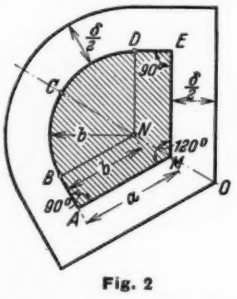


Fig. 2

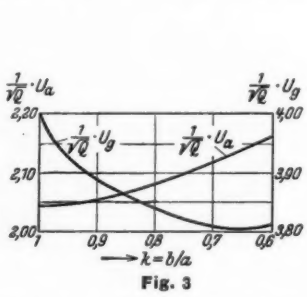


Fig. 3

section being fixed, is given by: $k = 1/(1+[A/\sqrt{3}(A+B)])$; where A = product of thickness, specific gravity and price per lb. of conductor insulator and B = the sum of the corresponding products for the wrapping layers.

The economy of the T-SO cable is shown by the following comparisons, which relate to 3×120 sq. mm., 60 kV cables:—

	New T-SO cable.	Sector cable (circular sheath).	SO cable (circular cores, triangular sheath).	Round-core, round-sheath cable.
Cross section of impregnated paper	100	115.9	104.5	142.5
Circumference under lead sheath ...	100	103.1	103.2	113.7
Weight	100	105.3	102.9	120.2

Apart from its light weight and ready adaptability to variations in the cost of materials, the new cable is specially flexible and has good self-cooling characteristics. The absence of acute angles on the sector cores, facilitates uniform insulation.

Accident on a Cable Ship

The cableship *Telconia*, of the Telegraph Construction & Maintenance Co., Ltd., Greenwich, under Captain Carlton, arrived at Gibraltar last Saturday and landed the body of Mr. Johnson Pogson, the boatswain, and Mr. John Cottingham, the storekeeper, who is seriously injured and has been taken to hospital. The accident occurred while the *Telconia* was engaged in repairing the Spanish Government cable from Cadiz to Arzil. The cable broke on the grapnel, and one of the stoppers, which was already secured to the cable, flew overboard and struck Pogson and Cottingham. At the inquest on Mr. Pogson a verdict of death by misadventure was recorded.—*Reuter.*

Analysis of Coal Ash

The Department of Scientific and Industrial Research has issued a Fuel Research Survey Paper (No. 28, Stationery Office, 6d.), dealing with the methods of analysis of coal ash. In the absence of any recognised scheme for the analysis of coal ash, the report provides a basis upon which to build a complete collection of methods for all types of coal ash and its constituents. Suggestions for improvements and extensions of the methods are invited.

Coal ash consists of a complex mixture of elements, mainly present as oxides (or, in combination with silica, as silicates), and generally some sulphates. The methods described have been adapted, after extended trials, from those already recognised for the analysis of silicate rocks and other materials similar in composition to coal ash. Methods are given for the separation and estimation of silica, iron, titanium, aluminium, calcium, manganese, magnesium, phosphorus, alkalis and sulphur trioxide. The precipitation of titanium by "cupferron" solution is an interesting example of the newer practice, which seems likely to be increasingly adopted in the future, of employing organic reagents in place of inorganic reagents.

In addition to these major constituents, there occur smaller and variable amounts of constituents which may have an important bearing upon the properties and uses of the coal. Methods for the determination of some of these are still under investigation and are not included in the report. Many other elements, including rare elements, have been detected from time to time in coal or coal ash, and an appendix gives a bibliography of reported occurrences of these. In view of their possible action as catalysts in certain processes of coal utilisation (*e.g.*, hydrogenation), their detection and determination has recently assumed considerable practical importance. They often occur as mere traces, but the report states that the progress already made in spectrum analysis indicates that this may prove a satisfactory and rapid method of determining the amounts of certain of these elements.

Distribution Reliability

In a paper read before the Edison Electric Institute, Chicago, recently, Mr. S. M. Dean discussed methods of obtaining maximum reliability in a distribution system dependent upon a single feed. He advocated (1) the use of an unearthed neutral with a proper earth-detector signal system, to permit of operation until the location and repair of the fault; (2) ringed primary lines; and (3) banked transformers connected in parallel and fused to 300 per cent. of rating on both primary and secondary sides. He stated that the cost of such a system was little more than that of the ordinary radial system.

The Dynatron Generator

The frequency of a valve generator approximates to the natural frequency of the attached circuit, the exact frequency being a function of the supply voltage. The mechanism by which a change of supply voltage alters the frequency is obscure.

In a paper contributed to the *Journal* of the I.E.E., Mr. E. B. Moullin develops a method of calculating the effect of the curvature of the characteristic on the frequency of the dynatron generator. He shows that the fundamental frequency is affected by the phase of the higher-harmonic components of anode potential and that the effect would be zero if the impedance of the circuit were purely resistive to the higher-harmonic currents. The change of frequency accompanying change of output is found to be much greater than can be accounted for by the curvature of the characteristic, presumably due to some other cause of instability inherent in the valve. It is suggested that the electrode capacitance may depend on the condition of the space charge.

An Inquisitive Cat

The electricity supply to Whipps Cross Hospital, Leytonstone, failed one day last week, the cause being a cat which explored the hospital sub-station with tragic results, receiving a shock at 6,000 V. Fortunately the operating theatre has its own supply and was, therefore not affected by the breakdown. The supply was restored by the Leyton Corporation Electricity Department within half an hour.

Appointments Vacant

Charge engineer for Gravesend Corporation.

Lady showroom assistant and demonstrator for Walsall Electric Supply Department. (See our classified advertisement pages.)

Makers' Names Wanted

JUNOITE insulating material.
CELERON insulating material.
MELOTTE wire.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Lt.-Col. R. K. Morcom, director of Messrs. Belliss & Morcom, Ltd. is among the additional members appointed to the Overseas Trade Development Council.

[*Elliott & Fry*

Lt.-Col. R. K. Morcom

Mr. H. V. Senior, who for many years was in charge of the Diesel Engine Department of Messrs. Robey & Co., Ltd., of Lincoln, has joined the staff of the Brush Electrical Engineering Co., Ltd., of Loughborough. Mr. Senior is well known in the Diesel engine field, and under his supervision the Brush Electrical Engineering Co. will shortly place on the market a range of Diesel engines of an improved design embodying his experience extending over a period of thirty years. The range includes engines of the multi-cylinder horizontally opposed type suitable for electrical purposes.

Mr. W. H. Saunders, of Messrs. A. H. Saunders & Son, electrical engineers, London Road, Horsham, was married on August 3rd to Miss Olive M. Edwards, only daughter of Mr. J. R. Edwards, Arthur Road, Horsham.

Mr. Noel Greenway, of Birmingham, has been appointed consulting engineer by the Tamworth E.C. for its electricity scheme.

Mr. J. Leadbeater, borough electrical engineer of Hampstead, was intended to be included in the group of municipal electrical engineers on page 181 of our last issue, but unfortunately the photograph supplied by an agency was of another gentleman of the same name. We have now received the correct one, which we have pleasure in reproducing, at the same time tendering our apologies for the error to both the gentlemen concerned.

[*Elliott & Fry*

Mr. J. Leadbeater, borough electrical engineer, Hampstead

Dr. Oliver E. Buckley, assistant director of research of the Bell Telephone Laboratories since 1925, has been appointed director to fill the vacancy caused by the recent death of Dr. H. DeForest Arnold.

Mr. A. S. Barker, manager of the electricity showroom at Barking, has resigned, and has been succeeded by **Mr. A. W. Pilgrim,** who has been his assistant.

Col. D. Bates

Col. D. Bates, D.L. (for the County of Lancaster), J.P., T.D., who has been in the service of British Insulated Cables, Ltd., as works manager of their Prescot Works for the past thirty-eight years, is retiring from active business at the end of October. He will retain his seat on the works committee of the company and also his connection in a consultative capacity.

A number of leading Italian electrical engineers recently met together at a banquet in Rome in honour of **Prof. Angelo Banti,** the founder and director of our Italian contemporary *L'Elettricista,* to mark the completion of the first forty years' existence of the journal.

Mr. W. Frisby, borough electrical engineer of Colchester, has been given an increase in salary of £50 per annum as from June 6th, and there is to be further consideration of the matter at the end of a year.

Mr. Charles Bloore, who is with the General Electric Co., Ltd., at Sutton Coldfield, Birmingham, has been appointed to succeed his brother, the late T. A. Bloore, electrical engineer and manager to the Retford Corporation. He is the son of Mr. T. Bloore, the Sutton Coldfield borough electrical engineer, and was educated at Bishop Vesey's Grammar School and the Birmingham Central Technical School. During the war he served for two and a half years in a destroyer. His apprenticeship was served with the G.E.C. at the Witton Works, and for two years he was testroom assistant. After holding the position of engineer surveyor to the Vulcan Boiler & General Insurance Co. Ltd., for four and a half years, he became contract engineer to the G.E.C., being responsible for many municipal and industrial contracts involving overhead and underground distribution schemes and power station equipment.

Mr. Charles Bloore

Douglas Town Council has increased the salary of **Mr. Bertram Kelly,** the borough electrical engineer, by £25 per annum for a period of two years, in recognition of his being responsible for generating the electricity required for the supply to the rest of the Isle of Man. The salary is to be reviewed at the end of that period.

Mr. H. F. Gunnel Woods, B.Sc., M.I.E.E., A.M.I.Mech.E., manager to the East Devon Electricity Co., Ltd., the Wellington District Electricity Co., Ltd., and the Exe Valley Electricity Co., Ltd., was married in London on August 8th to Miss Joan Margaret Stenlake.

Mr. A. Bates, of the staff of the Corporation electricity showrooms at Walsall, was married on August 5th to Miss I. Banton. He was presented by his colleagues with an armchair.

Miss Dorothy L. Keale, who is partner in the firm of Messrs. V. & D. Keale, electrical engineers, High Street, Staines, was married last week at St. Paul's Church, Egham, Hythe, to Mr. Frederick J. Taylor, of Wraysbury.

Obituary

Mr. T. J. Grainger.—A memorial service for Mr. T. J. Grainger, managing director of T. J. Grainger & Co., Ltd., whose death was referred to in our last issue, was held at Gateshead Methodist Church on August 10th. The interment took place at Saltwell Cemetery. In addition to members of the family and personal friends, representatives of many movements and organisations with which Mr. Grainger had been connected were present, including fellow magistrates, church, Brotherhood, Rotary and Masonic associates. The following gentlemen represented various branches of the electrical industry:—Mr. C. Meakin, director, T. J. Grainger & Co., Ltd., and the staff of the company; Mr. Ferry, representing Mr. C. Wilson, managing director, Osram-G.E.C. Lampworks; Mr. M. Ryle (Osram-G.E.C. Glassworks, Wembley); Mr. W. Horsfall (G.E.C., London); Mr. Mavin (G.E.C., Newcastle); Mr. W. Fitzgerald (Edison Swan Electric Co., Ltd.); Mr. F. F. Turner (Philips Lamps, Ltd., Newcastle); Mr. F. J. Jones (Siemens Electric Lamps & Supplies, Ltd., Preston); Mr. R. D. Page (Siemens Electric Lamps and Supplies, Ltd., Newcastle); Mr. J. K. Green (Sun Electrical Co., Ltd., Newcastle); Mr. A. Albrecht, secretary, Electrical Wholesalers' Federation; Mr. G. W. Barrass and Mr. J. H. Roscoe (Lemington Glassworks Ltd.); Mr. H. Barkes (British

The late Mr. T. J. Grainger

Electrical & Mfg. Co.); Mr. J. Gledson (J. Gledson & Co., Ltd.); Mr. Wilson (Johnson & Phillips, Ltd.); Mr. Wilson (W. T. Henley's Telegraph Works Co., Ltd.); Mr. Cross (Falconar, Cross & Co., Ltd.); and Mr. A. S. Tong (Foster Engineering Co.).

Mr. J. W. Ward, who died on August 5th after a long illness, served from 1914 onwards both in France and India, and afterwards became well-known in London electrical circles. In 1930 he was appointed London district manager for Simplex Conduits, Ltd., prior to which he held for a period the post of assistant district manager to the company. Mr. Ward leaves a widow and one child.

The late Mr. J. W. Ward

Dr. Ing. R. Abt.—The death recently occurred at Lucerne, Switzerland, at the age of eighty-two years, of Dr. Ing. Roman Abt who was known throughout the world as the inventor of the Abt system of mountain rack railway traction, the first line of the kind being the Harzbahn, near Brunswick, Germany, which was built in 1884.

Mr. J. M. Beattie.—The death occurred recently, as the result of an accident, of Mr. James Mitchell Beattie, of Gravesend, who had since 1919 been foreman electrician to the Orient Steam Navigation Co., Ltd., at Tilbury Dock. He was apprenticed to electrical engineering at Edinburgh, and was for twenty years a seagoing electrician with the Orient Company before taking up the position at Tilbury. He was sixty-nine years of age.

Mr. A. J. Church, who was in business as an electrical engineer in South Street, Wellington, Somerset, died recently at the age of fifty-three.

Monsieur C. Bourdon.—The death recently occurred in Paris, at the age of eighty-six years, of M. Charles Bourdon, who was for many years professor of steam engineering at the Ecole Centrale des Arts et Manufactures in Paris and the inventor of the well-known steam-pressure gauge bearing his name.

Wills.—Mr. J. A. Constable, resident engineer (Generation Department) to the South Metropolitan Electric Light and Power Co., Ltd., at Blackwall Point, Greenwich, S.E., left £5,732 (net personalty £5,633).

Mr. W. Gibbins, formerly chairman of the Birmingham Battery and Metal Co., Ltd., left £235,510 (net personalty £223,791).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Austin Lifts, Ltd.—Private company. Registered August 8th. Capital, £10,000 in £1 shares. Objects: To acquire the business of an electrical engineer and lift manufacturer carried on by James Mair at Newcastle-on-Tyne as "Austin & Co." The subscribers (each with one share) are: Jas. Mair, 14, Moorfield, Newcastle-on-Tyne, and Arthur H. S. Glenton, 4, Cloth Market, Newcastle-on-Tyne. J. Mair is the permanent governing director. Solicitors: Dickinson, Miller & Turnbull, Cross House, Westgate Road, Newcastle-on-Tyne.

Hurtons (Electrical), Ltd.—Registered August 8th. Capital, £100 in £1 shares. Objects: To carry on the business of electrical, mechanical, wireless, and general engineers, &c. The permanent directors are: Fdk. A. Laws, 42, Old Lodge Lane, Purley, Surrey (managing director), and Geoffrey Steven, 33, Furze Lane, Purley, Surrey. Registered office: 106, Regent Street, W.1.

Comet Battery Service (Hull), Ltd.—Private company. Registered August 8th. Capital, £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless and electrical apparatus and equipment, &c. The directors are: Geo. H. Hollingbery, 24, St. George's Road, Harrogate, and Walter P. Honor, 33, The Link, Anlaby Park, Hull. Registered office: 293, Wincolmlee, Hull.

Commercial Illumination, Ltd.—Private company. Registered August 10th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electrical, gas and oil fittings and accessories, parts and equipment, electricians, lighting, heating and radio engineers, &c. The directors are: E. M. Wallisch, 8, Churston Mansions, Gray's Inn Road, W.C.1; and F. H. Moore, 46, Crescent Lane, Clapham Park, S.W.4. Remuneration as fixed by the company.

Tinsley Electric Co., Ltd.—Private company. Registered August 10th. Capital, £1,000 in £1 shares. Objects: To acquire the business of a wireless dealer and electrician, heretofore carried on by Thomas Cocker as the Tinsley Electric Co. at 303, Sheffield Road, Tinsley, Sheffield. The subscribers are: T. Cocker and Mrs. I. Cocker, both of 303, Sheffield Road, Tinsley, Sheffield.

Davis Manufacturing Co. (Finsbury), Ltd.—Private company. Registered August 11th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless sets and parts, gramophones, &c. The directors are: S. L. Levy, 15, Hallswell Road, N.W.11; P. Levy, 59, Delaware Mansions, W.9; and H. Davis, 11, Fairview Villas, Chingford, E.4. Registered office: 18, Christopher Street, E.C.2.

Spratley Bros., Ltd.—Private company. Registered August 14th. Capital, £1,000 in £1 shares. Objects: To adopt an agreement with Clifford D. Spratley and Reginald Spratley for the acquisition of stock and other assets of the business carried on by them as Spratley Bros. at 21/23, Royal Parade, Hayes, and to carry on the business of manufacturers of and dealers in wireless goods, &c. The permanent directors are: C. D. Spratley, 21/23, Royal Parade, Hayes, Mdx.; and R. Spratley, 48, Station Road, West Drayton, Mdx. Registered office: 21/23, Royal Parade, Hayes, Mdx.

A Arc, Ltd.—Private company. Registered August 12th. Capital, £5,000 in £1 shares. Objects: To carry on the business of engineers, manufacturers of electrodes, electrical and other forms of welding and soldering, electro platers, metal workers, &c. The directors are: L. M. Neumann, 52, Lonsdale Road, Barnes, S.W.13, and E. W. H. Fairbairn, 30, Ryecroft Road, S.W.16. Registered office: 123, Cannon Street, E.C.4.

Page Car Radio, Ltd.—Private company. Registered August 14th. Capital, £1,000 in £1 shares. Objects: To carry on the

British Overseas Electrical Trade in July

	Exports.			Imports.			Re-Exports.		
	Electrical exports for July, 1933.	Inc. or dec. as compared with June, 1933.	Inc. or dec. as compared with July, 1932.	Electrical imports for July, 1933.	Inc. or dec. as compared with June, 1933.	Inc. or dec. as compared with July, 1932.	Electrical re-exports for July, 1933.	Inc. or dec. as compared with June, 1933.	Inc. or dec. as compared with July, 1932.
Insulated wires and cables ...	£105,431	+ £1,382	+ £27,772	£18,045	+ £2,707	+ £5,632	£518	+ £456	+ £491
Electric carbons	2,117	— 2,305	— 209	10,336	— 4,723	+ 825	15	— 166	— 4
Arc lamps and searchlights ...	125	— 517	— 21	—	— 153	— 517	70	— 40	+ 70
Incandescent lamps	33,746	— 7,781	— 922	21,505	+ 3,645	+ 6,727	817	+ 492	+ 170
Other lighting apparatus ...	23,825	— 4,421	+ 101	20,020	— 112	+ 1,452	3,508	+ 2,434	+ 1,211
Batteries and accumulators ...	58,495	+ 9,178	+ 10,226	859	— 1,156	— 2,525	74	— 11	+ 23
Meters and instruments ...	23,537	+ 4,667	— 6,891	21,916	+ 316	— 7,270	951	+ 748	+ 338
Unenumerated electrical goods and apparatus ...	82,881	— 10,109	+ 8,236	32,177	— 2,282	— 13,806	2,627	+ 764	— 599
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cables (not submarine)	18,204	— 10,490	+ 7,198	170	+ 18	— 465	—	— 463	— 171
Submarine telegraph and telephone cables...	525	+ 118	— 3,491	—	—	—	—	—	—
Telegraph and telephone apparatus	130,732	— 55,368	+ 7,715	51,307	+ 13,626	— 12,066	1,413	— 546	— 3,962
Electrical Machinery—									
Railway and tramway motors	960	— 4,024	— 6,104	—	—	—	—	—	—
Other motors and generators	128,125	+ 40,552	+ 12,499	—	—	—	—	—	—
Unenumerated electrical machinery	106,898	+ 5,800	— 80,589	14,056	— 6,147	— 18,771	6,367	+ 2,880	+ 2,108
Total	£715,601	— £33,318	— £24,480	£190,391	+ £5,739	— £40,784	£16,390	+ £6,548	— £325
Decreases for the first seven months of the year ...		Exports. £311,649			Imports. £321,209			Re-Exports. £49,434	

business of manufacturers of and dealers in radio apparatus, batteries, accumulators, accessories and fittings, loud speakers, gramophones, &c. The directors are: W. I. G. Page, Mayfield, Oxshott, Surrey; and C. E. G. Bailey, 5, Guilford Street, W.C.1. Secretary: Nellie E. Wilks. Registered office: 53, Windsor House, Victoria Street, S.W.1.

K. S. S. Distributors, Ltd.—Private company. Registered August 11th. Capital, £1,000 in £1 shares. Objects: To carry on the business of wholesale dealers in wireless goods, electrical fittings, &c. The directors are: J. J. Baker, Meadowbank, Highway, Maidenhead, Berks; and E. S. Baker, 40, Station Road, Redhill, Surrey. Secretary: D. B. Stevens. Registered office: 40, Station Road, Redhill, Surrey.

Returns of Electrical Companies

Robins, Ltd.—E. L. Molyneux, 5, St. Andrew's Crescent, Cardiff, was appointed receiver and manager on August 4th, under powers contained in debentures dated January 3rd, 1930.

Automatic Light Control, Ltd.—Debenture dated July 18th, 1933, to secure £500 and further advances, not exceeding in all £5,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Light Controlled Installations, Ltd., Moorgate Hall, E.C.2.

Supra Electra Motors, Ltd.—Issue on July 28th, 1933, of £200 debentures, part of a series already registered.

T. G. Brunskill, Ltd.—Particulars filed of £250 debentures authorised July 27th, 1933, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Lincoln Radio Relay Service, Ltd.—Particulars filed of debentures for not more than £1,500 authorised May 20th, 1933, charged on the company's property, present and future, including uncalled capital, the whole amount being issued on July 21st, 1933.

Maestro Products, Ltd.—Debenture, dated July 28th, 1933, to secure £100, charged on the company's property, present and future, including uncalled capital. Holder: Eliza A. M. Backmann, Brincliffe, Havelet, Guernsey, C.I.

Salora Lights, Ltd.—The nominal capital has been increased by the addition of £1,500 in £1 ordinary shares beyond the registered capital of £1,500.

Pickvance, Ltd.—John Unwin, of Prudential Buildings, Foregate Street, Chester, ceased to act as receiver and manager on July 19th, 1933.

Spalton Electrical Stores, Ltd.—Two notices of the appointments of K. Paterson, of Revenue Chambers, Howard Street, Sheffield, (1) as receiver on July 28th, 1933, under powers contained in debenture dated March 5th, 1932, and (2) as receiver and manager on July 31st, 1933, under powers contained in debenture dated October 8th, 1932.

Hela Radio, Ltd.—K. Paterson, of Revenue Chambers, 4, Howard Street, Sheffield, was appointed receiver and manager on July 31st, 1933, under powers contained in debenture dated October 8th, 1932.

Welsh Radio and Electrical Supplies, Ltd.—B. Baddiel, of Northampton Place, Swansea, ceased to act as receiver and/or manager on July 12th, 1933.

Waldron Electrical Manufacturers, Ltd.—B. Baddiel, of 10, Northampton Place, Swansea, ceased to act as receiver and/or manager on July 31st, 1933.

Hadden & Pearce, Ltd.—H. Rainsbury, of 20/21, Broad Street Avenue, E.C., ceased to act as receiver on July 31st, 1933.

Beeches Radio & Electrical Co., Ltd.—Arthur M. Smith, of 19, Stafford Road, Waddon, Surrey, ceased to act as receiver on July 30th, 1933.

Vortexion, Ltd.—W. L. Flower, of 19, St. George's Road, S.W.19, ceased to act as receiver on July 31st, 1933.

Johnson & Murrell Electric Co., Ltd.—Capital, £5,000 in £1 shares. Return dated December 31st, 1932 (filed May 15th, 1933). 1,000 preference and 2,200 ordinary shares taken up. £1,700 paid on 250 preference and 1,450 ordinary. £1,500 considered as paid on 750 preference and 750 ordinary. Mortgages and charges, nil.

Thressell Engineering Co., Ltd.—Capital, £150,000 in 5s. shares. Return dated May 22nd, 1933. 175,869 shares taken up. £40,803 5s. paid on 163,213 shares, £3,164 considered as paid on 12,656 shares. Mortgages and charges, nil.

H. T. Bourn, Ltd.—Capital, £800 in £1 shares. Return dated January 9th (filed May 2nd), 1933. 680 shares taken up. £680 paid. Mortgages and charges, nil.

E. W. Stockham, Ltd.—Capital, £1,000 in £1 shares. Return dated June 7th, 1932 (filed March 16th, 1933). All shares taken up. £200 paid. £800 considered as paid. Mortgages and charges, nil.

Resisto Electric Wire & Tape Co., Ltd.—Capital, £500 in £1 shares. Return dated January 13th, 1933. All shares taken up. £500 paid. Mortgages and charges, nil.

Suflex, Ltd.—Particulars filed of £1,000 debentures authorised August 1st, 1933, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Excelsior Electric Cleaner Co., Ltd.—Capital, £5,000 in £1 shares. Return dated December 1st, 1932 (filed June 8th, 1933). All shares taken up. £5,000 paid. Mortgages and charges, nil.

City Notes

E. K. Cole, Ltd.—Presiding at the annual meeting held on August 10th, Mr. W. S. Verrells (chairman), said that the fire in February last destroyed the models and plans for the new season's programme, and it had been almost impossible to carry this out. They had overcome their greatest difficulties, however, and the prospects were satisfactory. Their factory was working twenty-four hours a day making only radio cabinets. Mr. Verrells prophesied a great future for "Bakelite" material, which, he said, would be used in the manufacture of household furniture. They had experimented in making "Bakelite" tables, some of which had been sold.

The Mexican Light & Power Co., Ltd., reports a revenue for 1932 (in Canadian currency) of $3,428,172, as compared with $4,129,662 in the preceding year. Expenses absorbed $137,128, interest on bonds $2,656,813, and transfer to sinking funds $433,076, leaving a balance of $201,154, which is carried to profit and loss, leaving a surplus in that account of $2,696,550. The report states that the company is unable to resume payment of dividends on either of the classes of preference shares.

The Mexico Tramways Co. reports gross earnings (in Canadian currency) of $2,970,168 for 1932, as compared with $3,692,341 in 1931. After providing for depreciation reserve there was a net operating loss of $798,687, against a loss of $509,807. Taxes amounted to pesos 268,945, a decrease of pesos 116,219, the figure for 1931 including an extraordinary tax on gross earnings. The total decrease in expenses was $433,293.

Edmundson's Electricity Corporation, Ltd., reports that during July the electrical energy generated and purchased totalled 35,138,000 kWh, as compared with 27,963,000 kWh in the corresponding month of 1932, an increase of 26 per cent. The total for the first seven months of the current year was 260,897,000 kWh, as against 219,325,000 kWh in the corresponding period of 1932, an increase of 19 per cent.

The Bognor Gas & Electricity Co., Ltd., announces interim dividends at the rate of 8 per cent. per annum on the ordinary and additional "A" consolidated stocks, 9 1/5th per cent. per annum on the "B" consolidated and 7 per cent. per annum on the new consolidated, less tax, for the half-year; payable September 1st.

The Skoda Works reports a balance of 63,907,000 kc. for the year 1932 on the manufacturing and interest account, as compared with 132,436,000 kc. in 1931. After providing for interest, taxation, &c., there was a surplus of 33,573,000 kc., which is transferred to the depreciation account. The credit balance carried forward is again 11,074,000 kc.

Crossley Bros. & Co., Ltd., have decided to defer consideration of the payment of the preference dividend due on September 1st.

The Westminster Electric Supply Corporation, Ltd., has announced an interim dividend of 2½ per cent. (actual), less tax, on the ordinary shares (same).

The Globe Telegraph & Trust Co., Ltd., announces a quarterly dividend of 1s. per share on the ordinary shares, payable September 1st.

The Pennsylvania Water & Power Co. is to pay a quarterly dividend of 75 cents per share (same) on the common stock, payable October 2nd.

Waste Heat & Gas Electrical Generating Stations, Ltd., announce an interim dividend of 2½ per cent. (same), payable August 31st.

Stocks and Shares

TUESDAY EVENING.

INVESTMENT and speculation are both playing active parts in Stock Exchange markets, notwithstanding the seasonal and other barriers to business that crop up in various directions. The success of two considerable new issues made last week threw into high prominence the large amount of money that is available for investment in good class securities. The complaint continues that money is so cheap as to be almost unlendable. Those people who are so unfortunate as to have more money than they know how to spend are sadly put to it for a means of investing that money in such manner as shall conserve the capital, and, at the same time, afford them a living rate of interest on the money. The Government is expected to produce within some period a new scheme for funding the very substantial amount of floating debt which has accumulated. This expectation has the effect of keeping up the values of such issues as those of the Central Electricity Board, the London and Home Counties J.E.A., and similar gilt-edged securities. New issues are taken with a readiness, not to say avidity, which offers positive temptation to prospective borrowers. On all hands companies with debenture and similar debts are taking steps to reduce, where they are able to do so, the obligation imposed upon them by high rates of interest, and endeavouring to substitute, for these stocks, fresh securities whose service will entail a lower cost to the companies concerned.

Public Board Stocks

This week, the quotation of Metropolitan Railway consolidated stock disappears from the Stock Exchange Official Lists, and, accordingly, it is removed from the price-lists in our tables. In place of the section hitherto occupied by Home Railway stocks, it will be noticed that a fresh group has been set up, giving the prices of public board issues. In this are included some of the issues of the Central Electricity, the London and Home Counties, and the London Passenger Transport Boards. It is necessary to mention that in the cases of the redeemable stocks—those, for instance, of the Central Electricity and the London and Home Counties Authorities—the yield on the money has been calculated at the rate which a purchase of the stock at to-day's prices will give, without making any allowance for repayment. Where the price of the stock stands under 100, and redemption is due to be made at 100, the yield to redemption would be, of course, higher than that afforded by what is called the "flat" rate, though

where stocks stand above 100, and are repayable at 100, allowance must be made for the loss that will ensue, naturally, upon that repayment. The majority of issues in these latter days carry two dates, in order to give the borrower the option of repayment at either of them or at some year in between. The Stock Exchange method of working out yields per cent. in such cases is to take the worse of the two dates: that is to say, the date at which the loss would be greater, or the profit the less, when repayment is made. As an example, the yield on stock dated 1940-1950, and standing at 110, would be worked out on the assumption of the stock being repaid in 1940; though if the price were 90, then the yield would be taken from the 1950 date.

The Central Electricity 4½ per cent. stock quoted in our lists pays £4 5s. 9d. per cent. outright, but allowance for redemption reduces this to 4 per cent. on the money. The most recently issued 3½ per cent. stock, obtainable at 92¾ free of stamp, yields £3 16s. 6d. per cent. flat, but a few pence more —£3 17s. to be precise—by taking repayment into account. The first interest payment is 1 per cent., payable on December 1st this year.

Electricity Supply

What few movements have occurred in the prices of Home electricity supply companies' shares are mostly those of the provincial issues. Rises have occurred in Lancashire Light and Power ordinary at 33s. 9d., North Easterns at 32s., Northamptons at 51s. 3d., and Scottish at 37s. 6d. As mentioned on many previous occasions, the investor, seeing no particular prospect of improvement in the prices of issues in the London electricity supply companies' group, finds greater scope in the provincial field, and, accordingly, has been for some time past putting his funds into shares of the provincial undertakings. The shares of the London companies are now quoted at a range of prices between 32s. and 33s., the average rate of return being approximately £4 6s. per cent. on the money. It is taken for granted that the companies will pay 7 per cent. on their ordinary share capital for the present year —the standard rate, that is to say—but optimism is already busy with the forecast of a possible increase in this rate for 1934, though any change in the dividend must be made to correspond, of course, with a lowering of charges to consumers, in accordance with the requirements of the Act.

Chiswick Electrics are on offer, as to a couple of thousand shares, at 47s. North Metropolitans keep very steady about 57s. 3d.

Victoria Falls

Victoria Falls ordinary have risen to 93s. 9d., showing a gain of 2s. 6d. on the week. South African and most other gold-mining shares are in a state of high bullishness, owing to the strength of the price of the metal and the conviction that this is likely to be maintained for some time to come. In consequence, new areas are being opened up in South Africa, and it is contended that the Victoria Falls Power Company will obtain much business resulting from the supply of current to these new developments. The management is cautious to a degree, but those who have studied the company for a lengthy period are confident that the dividend will be increased when the debentures are paid off, as they will be in the near future, and the money hitherto required for their service can be diverted to the profit of shareholders and customers alike.

Mexican Uncertainties

Weakness in Mexican issues continues to be one of the principal features amongst foreign descriptions. It is true that the interest is being paid on Mexico Tramway 5 per cent. bonds, and on Mexican Light & Power first mortgage bonds. The quotations, especially the price of Mexico Tramway fives, indicate the uncertainty which is felt in regard to the ability of the companies to go on with the payments, more particularly in view of the recent reports which, it will be recalled, laid stress upon the particularly onerous character of the taxation recently imposed by Mexico. Dollar stocks are on the whole fairly steady. The New York Stock Exchange is attracting no particular attention from the British speculator, who at the moment is more concerned with gold shares than he is with American utilities.

Miscellaneous Matters

Babcock & Wilcox continue their decline, and at 33s. 9d. show a drop of 3s. 3d. For this there is no outstanding reason, but it may be suggested that the recent price of nearly 40s. was too high for Babcock shares to command at a time like the present, and that the subsequent reaction which has lowered the quotation to 34s. 6d. has reduced the shares to a more reasonable level. Other iron and steel shares are quiet, Vickers being 7s., and the list as a whole keeping tolerably steady. Associated Electrical Industries ordinary shares are 9d. better at 20s. 9d., and the preference have risen 2s. to 30s. 9d. A.E.C. have been an active market around 35s. Callenders are ⅛ easier at 3½. There has been a quiet inquiry for Telegraph Constructions and for shares in some of the other manufacturing companies, without this having any particular effect upon prices. Cables & Wireless stocks are unusually quiet. American Telephone & Telegraph has risen 3 points to 140½. Internationals rallied to 17 after being lower. Great Northern Telegraphs are 20s. down at 31½ on a little selling from Denmark.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1931.	1932.	Price, Aug 15.	Rise or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	75/-	—	4 0 0
Brompton Ordinary	1	8¾	7	32/6	—	4 6 2
Charing Cross Ordinary	1	8¾	7	33/0	—	4 4 10
Chelsea	1	8¾	7	32/-	—	4 7 6
City of London	1	10	10	33/6	—	4 3 7
Clyde Valley	1	7	7	37/6	—	3 14 8
County of London	1	10½	10½	53/9	—	3 18 1
Edmundson's 7% Pref.	1	7	7	31/6	+6d.	4 9 0
Elec. Dis. Yorkshire	1	9	9	45/-	—	4 0 0
Elec. Supply Corporation	1	11	11	70/-	—	3 2 10
Kensington Ordinary	1	8	7	32/6	—	4 6 2
Lancs Light and Power	1	7	7	33/9	+⅛	4 3 0
London Electric	1	9	7	32/6	—	4 6 2
Metropolitan	1	10	10	50/-	—	4 0 0
Midland Counties	1	7	7	35/-	—	4 0 0
Mid. Elec. Power	1	8	8	38/9	—	4 2 4
North Eastern Electric Ordinary	1	6	6	32/-	+6d.	3 15 0
Do. 7% Pref.	1	7	7	32/6	—	4 6 2
Northampton	1	10	10	51/3	+6d.	3 17 6
Notting Hill 6% Pref.	10	6	6	13	—	4 12 4
North Met. Elec. 6% Pref.	1	6	6	20/-	—	4 2 9
St. James' and Pall Mall	1	8	7	32/6	+6d.	4 6 2
Scottish Power	1	8	8	37/6	+⅛	4 5 4
South London	1	8¼	7	33/-	—	4 4 10
Urban 6% Pref.	1	6	6	29/-	—	4 2 9
Westminster Ordinary	1	8¼	7	33/-	+6d.	4 4 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	20/9	—	7 4 7
Yorkshire Elec.	1	8	8	43/9	—	3 13 2
PUBLIC BOARDS.						
Central Electricity 1950-70	Stock	5	5	109	—	4 11 9
do. 1951-73	,,	4½	4½	106	+1	4 5 0
do. 1963-93	,,	—	3½	92½	—	3 15 6
London & Home Counties 1955-75	,,	4½	4½	107	—	4 4 1
London Passenger Transport. A	,,	—	4½	113	—	3 19 8
Do. do. B	,,	—	5	117½	—	4 5 1
Do. do. C	,,	—	—	77	—1	—
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	140½	+3	6 8 0
Anglo-Am. Tel. Pref.	Stock	6	6	109½	+½	5 9 5
Do. Def.	,,	1½	1½	28	—	5 5 3
Cables & Wireless 5½% Pref.	,,	2¾	2¾	83½	—	3 5 10
Do. A 7½% Ord.	,,	Nil	Nil	30½	—½	—
Do. B Ord.	,,	Nil	Nil	14	—	—
Globe Tel. and T. Ord.	10	Nil	2½	12½	—	2 0 10
Do. do. Pref.	10	6	6	12½	+½	4 19 0
Great Northern Tel.	10	20	20	31½	—1	6 7 0
Marconi-Marine	1	10	7½	38/9	—	4 9 0
Oriental Telephone Ord.	1	12	12	2¾	—	*4 3 6
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	4/6	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/3	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	10½	—	—
British Electric Traction Df. Ord.	,,	5	5	420	—	—
Do. do. Pref. Ord.	,,	8	8	142½	—	5 12 3
Brazil Traction	100	—	—	14⅞	—	—
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	100½	—	4 19 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	20/-	—	—
Mexico Trams, 5% Bonds	—	5	5	30½	—2	16 8 0
Mexican Light Common	100	Nil	Nil	12½	—3½	—
Do. 7% Pref	100	7	7	15	—2½	—
Do. 1st Bonds	—	5	5	57½	—8	8 13 10
Victoria Falls Ord.	1	15	20	95/-	+⅛	4 4 0
Yorkshire (West Riding)	1	Nil	Nil	11/-	—	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	4	4	20/9	+9d.	3 17 1
Do. Pref.	1	8	8	30/9	+2/-	5 4 2
Babcock & Wilcox	1	14	9	33/9	—3/3	5 6 6
British Aluminium Ord.	1	5	5	31/3	—	3 4 0
British Insulated Ord.	1	15	15	72/6	—	4 2 4
Brush Ord.	Stock	Nil	Nil	35	—	—
Callender's	1	15	15	3½	—⅛	4 16 0
Do. 6½% Pref.	1	6½	6½	28/9	—	4 10 5
Crompton Parkinson Ord.	5/-	22½	—	18/3	—	6 5 7
Do. 8% Pref.	1	8	8	30/-	—	5 6 8
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	8/9	—	—
Enfield Cable Ord.	1	25	25	4½	—	5 11 1
English Electric	1	Nil	Nil	10/-	--	—
Do. do. Pref.	1	Nil	Nil	14/6	—	—
Ever Ready	5/-	35	35	27/9	—3d.	6 16 0
Ferranti Pref.	1	7	7	25/-	+3d.	5 12 0
G.E.C. Pref.	1	6½	6½	29/0	—	4 9 8
Do. Ord.	1	8	8	42/6		3 15 2
Henley's	1	30	30	6¾	—	4 16 0
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber	1	Nil	Nil	3/9	—	—
Johnson & Phillips	1	5	5	22/-	—	4 11 0
Siemens Ord.	1	7½	6½	24/6	—	5 6 0
Telegraph Construction	£1	Nil	Nil	22/6	—	—

*Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1931

29312. "Reception or transmission and reproduction or recording of sound transmitted electrically by the wireless principle." J. G. Nash. October 22nd, 1931. (395736.)

29443. "Manufacture or treatment of paper for use in electrical insulation." Standard Telephones & Cables, Ltd., T. R. Scott and M. C. Field. October 23rd, 1931. (395737.)

32402. "Electric luminous discharge tubes." General Electric Co., Ltd., H. G. Jenkins and J. W. Ryde. November 23rd, 1931. (395738.)

1932

826. "Electric fluid heating apparatus." R. A. Carleton. September 12th, 1931. (95709.)

927. "Electric power converting apparatus." British Thomson-Houston Co., Ltd. January 12th, 1931. (395742.)

928. "Electric regulating systems for dynamo-electric machines." British Thomson-Houston Co., Ltd. (General Electric Co.). January 12th, 1932. (395743.)

1178. "Revolution indicating instruments." British Thomson-Houston Co., Ltd., D. E. Jewitt, L. Griffiths and C. J. Morton. January 14th, 1932. (395717.)

1369. "Compound structural material and shaped articles made therefrom, more particularly for electrical purposes." Naamlooze Vennootschap Molybdenum Co. and P. Schwarzkope. January 16th, 1932. (395745.)

1400. "Electrically driven clocks." E. H. Stevens. January 18th, 1932. (395695.)

1435. "Electric discharge lamps." A. E. Chapman. December 16th, 1931. (395711.)

1507/8. "Electric totalisators." H. D. Black and A. A. C. Degen. January 18th, 1932. (395702/3.)

1521. "Protective arrangements for electric power transmission systems." General Electric Co., Ltd., and C. C. Garrard. January 18th, 1932. (395706.)

1660. "Armature windings for dynamo-electric machines." S. E. Pritt and Associated Electrical Industries, Ltd. January 19th, 1932. (395714.)

1750. "Mercury-vapour rectifiers." General Electric Co., Ltd., and E. Gallizia. January 20th, 1932. (395747.)

1793. "Apparatus for commutating or periodically interrupting electric currents." J. F. G. P. Hartmann. March 5th, 1931. (395748.)

2019. "Control of the frequency of magnetron oscillators." General Electric Co., Ltd., and E. C. S. Megaw. January 22nd, 1932. (395752.)

2082. "Multiplex modulated carrier-wave telegraph systems." Marconi's Wireless Telegraph Co., Ltd., and A. T. Witts. January 22nd, 1932. (394755.)

2089. "Electrically heated hollow-ware." T. W. Piper. January 23rd, 1932. (395756.)

2130. "System for the voltage transformation of direct current electrical energy." J. D. Cockcroft and E. T. S. Walton. January 23rd, 1932. (395758.)

3394. "Radio receiving apparatus." E. K. Cole, Ltd., and E. J. Wyborn. February 4th, 1932. (395777.)

3438. "Secret combination switch for the ignition circuits of engines." B. Lee and F. P. Bevis. November 2nd, 1932. (395778.)

3462. "Mercury-vapour rectifiers." Akt.-Ges. Brown Boveri et Cie. February 5th, 1931. (395779.)

3516. "Speed governing mechanism for prime movers." British Thomson-Houston Co., Ltd., and D. E. Jewitt. February 5th, 1932. (395780.)

3529. "Current-collecting devices for electric railways." W. T. Gray and Associated Electrical Industries, Ltd. February 5th, 1932. (395781.)

3728. "Projection printing machines particularly for sound films." British Thomson-Houston Co., Ltd., and K. J. R. Cocke. February 8th, 1932. (395784.)

4352. "Illuminating systems and apparatus for use in connection with motor vehicles." T. Dudson. February 13th, 1932. (395791.)

5028. "Electric discharge devices." British Thomson-Houston Co., Ltd. February 19th, 1931. (395794.)

5137. "Flex drums and contacts for electrical instruments of a dental and surgical character and trays for such instruments." Dental Manufacturing Co., Ltd., and W. G. Lee. February 20th, 1932. (395795.)

5259. "Construction of electron discharge tube used for the recording of sound." Fidelity Films, Ltd., and F. K. Crowther. February 22nd, 1932. (Addition to 364146.) (395799.)

5434. "Time-delay electric switches." W. Hamilton. February 23rd, 1932. (395801.)

5827. "Electric protective arrangements." International General Electric Co., Ltd. February 26th, 1931. (395803.)

6062. "Luminous gas discharge tubes." Uneon, Ltd., and L. H. Soundy. February 29th, 1932. (Cognate application 11753/32.) (395804.)

7613. "Automatic gas controllers and electric time switches." F. O. Horstmann and Horstmann Gear Co., Ltd. March 15th, 1932. (395813.)

7671. "Vacuum cleaners." Electrolux, Ltd. March 16th, 1931. (395814.)

8358. "Electric heating pads for treatment of the body." Pelithe Holding Akt.-Ges. March 28th, 1931. (395817.)

8699. "Electrically heated vessels such as kettles and the like." General Electric Co., Ltd., O. W. Humphreys, and C. W. Stopford. March 23rd, 1932. (395819.)

9566. "Coupling systems for thermionic amplifiers." Radioakt-Ges. D. S. Loewe, and P. Kapteyn. April 4th, 1931. (Addition to 3305/32.) (395823.)

10807. "Conduit fittings." E. P. S. Cattle. April 15th, 1932. (395825.)

11082. "Tachometer generators for motor vehicles and the like." British Thomson-Houston Co., Ltd., and L. Griffiths. April 18th, 1932. (395827.)

11892. "Electric switches or circuit breakers." British Electrical and Allied Industries Research Association, W. B. Whitney, E. B. Wedmore, and F. O. Mason. April 25th, 1932. (395833.)

14591. "Electrolytic condensers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 9th, 1932. (395842.)

14629. "Electric high-tension switches." International General Electric Co., Inc. May 23rd, 1931. (395843.)

15319. "Electric discharge devices." British Thomson-Houston Co., Ltd. May 29th, 1931. (395851.)

15559. "Starting devices for synchronous alternating electric current motors." G. A. Cheetham, and Associated Electrical Industries, Ltd. June 1st, 1932. (395852.)

15990. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. June 5th, 1931. (395854.)

16276. "Pull-off fitting for curved overhead electric current conducting lines." F. Morris. June 9th, 1932. (395857.)

16999. "Method of producing highly emissive thermionic cathodes according to the metallic vapour process." Radioakt-Ges. D. S. Loewe and Dr. E. Waldschmidt. June 20th, 1931. (395862.)

19290. "Electric motor control systems." Electrical Research Products, Inc. January 7th, 1932. (395872.)

19339. "Valve rectifiers." Akt.-Ges. Brown, Boverie et Cie. July 11th, 1931. (395873.)

20200. "Automatic telephone systems." F. Rumpf. July 16th, 1932. (Addition to 16582/32.) (395876.)

23200. "Electric discharge tubes and apparatus incorporating the same." Telefunken Ges. für Drahtlose Telegraphie. August 18th, 1931. (395882.)

23378. "Electric switch and socket combination with protective arrangement." D. W. Davies. August 20th, 1932. (395884.)

24067. "Rectifier installations." Akt.-Ges. Brown, Boveri et Cie. March 26th, 1932. (395887.)

26245. "Contacts of electrical make-and-break apparatus." Allmänna Svenska Elektriska Aktiebolaget. September 21st, 1931. (395896.)

28212. "Electrically operated amusement apparatus." H. G. O. Phillips. October 10th, 1932. (395905.)

28848. "Welding apparatus." British Thomson-Houston Co., Ltd. (General Electric Co.). October 15th, 1932. (395907.)

28876. "Rubber mixture for insulation purposes, especially for the insulation of marine communication cables." Siemens and Halske Akt.-Ges. October 24th, 1931. (395908.)

30525. "Single-phase motors." Akt.-Ges Brown, Boveri et Cie. December 8th, 1931. (395917.)

31649. "Combined insulators and holders for suspended electric lamps." Deutsche Ton & Steinzeugwerke Akt.-Ges. November 10th, 1931. (395922.)

33226. "Automatic device for the mechanical and electrical operation of burglar alarms." C. J. Bolton and B. R. Lockett. November 24th, 1932. (395928.)

35444. "Lighting system for road vehicles, aircraft, or watercraft." P. A. Gandillon. October 25th, 1932. (395934.)

36354. "Interdependent pulsating electric circuits." British Thomson-Houston Co., Ltd. December 23rd, 1931. (395942.)

1933

1179. "Electric switches." Felten & Guilleaume Carlswerk Akt.-Ges. August 16th, 1932. (395953.)

2118. "High-tension electric batteries." W. Fleet. January 23rd, 1933. (395959.)

2172. "Electric trap for animals." F. Holst. January 23rd, 1933. (395961.)

2641. "Lamp for electrical illumination." F. Wachter. February 12th, 1932. (395966.)

2658. "Electric welding." British Thomson-Houston Co., Ltd. January 28th, 1932. (395967.)

4635. "High-tension dynamo-electric machines." English Electric Co., Ltd., and F. A. Youngmark. February 15th, 1933. (395980.)

4783. "Control of eddy-current track brakes." Siemens-Schuckertwerke Akt.-Ges. February 27th, 1932. (395982.)

5208. "Tele-kinematograph and like transmitters." Telefunken Ges. für Drahtlose Telegraphie. February 20th, 1932. (395985.)

8976. "Mercury and like fluid flow electric switches." British Thomson-Houston Co., Ltd. March 25th, 1932. (396001.)

11583. "High-frequency distribution systems for radio reception." Telefunken Ges. für Drahtlose Telegraphie. April 20th, 1932. (396008.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from August 9th:—

Duo-Met. No. 542308. Class 5. Wire.—Richard Johnson & Nephew, Ltd., Bradford Ironworks, Bradford, Manchester.

T.C.A. (lettering and design). No. 535567. Class 8. Radio receiving sets, loud speakers, phonograph records, electric pick-up attachments, and television receiving sets.—Transformer Corporation of America, Chicago, U.S.A. (British representatives: Frank B. Dehn & Co., 102, Kingsway, W.C.2.)

Cromwell Radio Receiver (lettering and design). No. 540712. Class 8. Radio receiving sets.—William Dibdin & Son, Ltd., Antelope Buildings, St. Mary's Road, Southampton.

Scat. No. 541891. Class 8. Automatic apparatus for giving audible or visible warning in cases of attempted thefts of motor cars.—Claude Lyons, Ltd., 76, Oldhall Street, Liverpool.

Solon. No. 538756. Class 13. Electric irons, immersion heaters, waffle irons, coffee percolators, milk warming pans, curling tongs, tea infusers and branding irons. No. 538757. Class 18. Electric heating and cooking stoves, and radiators for heating.—W. T. Henley's Telegraph Works Co., Ltd., 11, Holborn Viaduct, E.C.1.

Miscanlite. No. 541447. Class 13. Electric torches.—Grosvenor Electric Batteries, Ltd., 2-3, White Street, Moorgate, E.C.2.

Preferato. No. 542457. Class 13. Handles embodying electric switches for electric irons and similar appliances, and switches for attachment to the handles of such appliances.—Lockett, Crossland & Co., Moulton Street, Strangeways, Manchester.

Butonook. No. 543064. Class 13. Electric irons.—The Edison Swan Electric Co., Ltd., 123-125, Queen Victoria Street, E.C.4.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Abingdon.—Houses (40); Modern Construction Co., builders.
Barnes (SURREY).—Six shops, Upper Richmond Road; J. H. Coleman.
Batley.—Houses (40); borough surveyor.
Bedford.—Houses (100), London Road Estate; C. H. Blakeway, borough engineer.
Birmingham.—Hospital centre, with power house (£636,335); Wilson Lovatt & Sons, builders, Clarence Street, Wolverhampton. Extensions, Eagle Transfer Co.'s premises, Springcroft Road, Springfield (£6,000), with electrical work; S. Smith (Bidford), Ltd., builders, Corporation Street.
Blackpool.—Factory, Bispham; Associated Textile Industries, Ltd., Macclesfield. Town hall alterations; borough engineer.
Blean (KENT).—Heating installation, poor law institution (£5,620); county architect.
Boston.—Factory extensions, High Street, for J. Rank, Ltd.
Brierley Hill.—Houses (48); U.D.C. surveyor.
Cardiff.—Conversion of Empire Theatre, Queen Street, into cinema; Theatre Co.
Castleford (YORKS).—Shops, Carlton Street; W. C. Bickerton, architect, Bankroyd Chambers, Bank Street.
Chester.—Alterations, Royalty Theatre; Theatre Co.
Chesterfield.—Municipal buildings, Rose Hill Estate (£124,500); A. J. Hope, architect, of Bradshaw, Gass & Hope, Bolton.
Chichester.—Extensions, police quarters (£5,000); county architect.
Cirencester.—Houses (124), Bowling Green Farm; U.D.C. surveyor.
Colchester.—Slipper baths, &c. (£8,595); F. Hutton & Son, builders.
Coxeath (KENT).—Alterations, poor law institution (£3,750); county architect.
Cranbrook (KENT).—Houses (24); Capt. Lewis, R.D.C. surveyor.
Darlington.—Houses (29), Locomotive Street; W. Lyall, architect, 19, Victoria Road.
Dartford.—Houses (150), Priory Park Estate; W. J. Brise.
Douglas (I.o.M.).—Houses (150), Pulrose Estate; J. E. Teare, architect. Store extension, Demesne Road; Creer Bros.
Droitwich (WORCESTERSHIRE).—Branch library; county architect.
Dudley.—Lock-up shops and flats, New Street (£14,487), with electrical work; F. H. Gibbons, borough engineer.
Dumfries.—Houses (50); burgh surveyor.
Durham.—Houses (47), Long Acre, for H. Pearson. School, Lanchester, and extensions, Council School, Leadgate, for County E.C. (£4,500); F. Willey, architect, 34, Old Elvet.
Easington.—Houses (190); C. W. Clarke, surveyor.
East Grinstead.—Houses (50), Sackville Estate; U.D.C. surveyor.
Edinburgh.—Houses (56), Stevenson Avenue; C. E. Tweedie and Sons, architects, 54, Frederick Street.
Erith.—Houses (141), Bedonwell Road, for W. H. Wedlock, Ltd.
Essex.—School, Whalebone Lane, Chadwell Heath; additional floor at "D" block of the Institution, Romford; and combined treatment centre, South Benfleet; J. Stuart, county architect, County Hall, Chelmsford.
Falkirk.—Addition for Grahamston Iron Co.; manager.
Glasgow.—Buildings, Parkhead, for British Bitumen Emulsions, Ltd., 55-58, Pall Mall, London, S.W.1; R. G. Walker, Hardie & Smith, architects, 108, Douglas Street. Shops, houses and workshop for the Housing Department; architect, Housing Department. School, Berryknowes Road (£4,493); Cowiesons, Ltd. School, Dixon Road, for Corporation; John Burnet, Son and Dick, architect, 16, Blythswood Square.
Goole.—Church (£3,500); E. Mitchell, builder, Howden.
Grantham.—Workshops, King's School; Read Bros., builders.
Halesowen.—Houses (24); W. J. Tolley, builder. Houses (26), Oak Tree Crescent, for J. H. Haywood. Houses (20), Albert Road, Hasbury, for R. Hall.
Hampshire.—Casual ward extensions, Fareham (£5,208); county architect, Winchester.
Herne Bay.—Bathing pool (£50,000); U.D.C. surveyor.
Hetton-le-Hole.—Houses (87); A. H. Fennell, architect, Bridge End Chambers, Chester-le-Street.
Huddersfield.—Municipal offices, Ramsden Street, and fire station, Princess Street (£30,000); borough surveyor.
Hunsworth.—Houses (42), Hunsworth Lane; Harold Hirst and Son.
Ipswich.—Reconstruction and additions, central police station, with electrical work (£5,328); G. A. Kenney & Sons, builders, Burrell Road. Enlargements, Fore Street Bath (£2,000); city engineer.
Irish Free State.—(CORK).—Reconstruction and completion of flour mills, Victoria Quay, for the National Flour Mills, Ltd.; Chillingworth & Levie, architects, 11, South Mall.
Isle of Ely.—School, March (£15,281); Messrs. Jellings, builders, Peterborough. Extensions, Parson Drove School (£3,462); J. Guttridge & Sons, builders, Peterborough.
Kidderminster.—Works extensions, Green Street, for T. & A. Naylor.
Knottingley (YORKS).—Houses (58); U.D.C. surveyor.
Leeds.—Extensions, Little Queen Street, for James Hare, Ltd., 72, Wellington Street (£6,000); Kitson, Parish & Ledgard, architects, Vicar Lane.
Lincoln.—Houses (445); city surveyor.
London.—(ACTON).—Factory, Melrose Road; E. H. Stoddart and Co., architects. (EALING).—Houses (41), Western Avenue; London & Provincial Building Co., Ltd. (GREENWICH).—Infant welfare and artificial sunlight treatment centres, Charlton; borough engineer.
Lydd.—Development of "Lydd-on-Sea" Estate (600 acres); Councillor C. E. Andrews.
Macclesfied.—Houses, Moss Lane, with electrical installations; Gorton & Wilson, builders, Elizabeth Street.
Maidstone.—Observation block and extensions, isolation hospital, Loose; T. A. Busbridge, engineer, 26, Tonbridge Road.
Manchester.—Houses (400), between Heaton Park and Prestwich; Lane & Sons, Ltd., builders, Morpeth Street, Swinton.
March (ISLE OF ELY).—Post office, Dartford Road; H.M. Office of Works.
Margate.—Rebuilding amusement centre (£150,000) with cinema for Dreamland (Margate), Ltd., Marine Terrace; secretary.
Middlesbrough.—Chapel, St. Joseph's R.C. Church, Marton Road; R. Spinks, builder, Fairfield Road, Bridlington. Alterations to premises, North Street, for the National Union of Seamen; T. A. Page and Sons, architects, 67, King Street, South Shields. Extension of bakery premises, Marton Road, and alteration of premises, Grange Road, for R. Spark and Sons, Ltd.; Kitching and Co., architects, 21, Albert Road.
Morecambe.—Houses (40), Osborne Road; Brook & Kershaw. Houses (25), Scawfell Avenue; Barlow & Brown. Branch bus depôt; borough engineer.
Motherwell.—Houses, Ladywell Road and Farnock Drive (£9,600); Scott & Co., builders, Edinburgh.
Nantwich (CHESHIRE).—Houses (20), Jubilee Terrace, for W. Chetwood.
Newcastle-on-Tyne.—Houses (42), Iolanthe Crescent; W. W. Frankland, builder, Winniefield Road. Houses (117), Scotswood Estate; H. Kindred, builder, "Westacres." Rebuilding of glassworks for S. Bamford and Co., City Road.
North Cray (KENT).—Houses (130), Foots Cray Road, for the Workmen's Housing Association, Ltd.
Northfield (NEAR BIRMINGHAM).—Saw mill and timber stores, Austin Works, Longbridge (£30,000), with electrical work; Wilson Lovatt & Sons, builders, Clarence Street, Wolverhampton. Shops, Broughton Crescent, for the Ideal Benefit Society (£5,000), with electrical work; J. Harper & Sons, builders, Blackheath, Birmingham.
Nottinghamshire.—Enlargement of Bagthorpe School, Selston (£2,000); county architect. Extension, operating theatre, Basford Institution (£2,500), for Assistance Committee.
Ockendon (ESSEX).—Telephone exchange, South Ockendon; H.M. Office of Works.
Oxford.—Secondary school for City Education Committee; H. F. Hurcombe, architect, Town Hall.
Perth.—Cinema (£30,000); Robert Wotherspoon, solicitor, Inverness.
Peterborough.—Houses (30), Park Lane Estate and Fulbridge Road Estate; city engineer, Municipal Buildings. Extensions, Memorial Hospital; A. W. Ruddle, architect, Long Causeway.
Potter's Bar.—Houses (62) for Messrs. Sainsbury.
Preston.—Maternity ward, etc., Royal Infirmary (£24,000); secretary.
Radlett (HERTS).—Bank, Station Approach; Barclay's Bank, Ltd.
Romford.—Houses (30), Carlton Road, for Lawes, Cherry & Co.
Rowley Regis (STAFFS).—Houses (87), Tibbetts Garden; C. Buckley, Council House, Old Hill, Staffs.
Sale (CHESHIRE).—Welfare centre (£2,750); county architect, Crewe.
Salisbury.—Houses (40); city surveyor. Block of flats for Courts, Ltd.; Bothams & Brown, architects, Chipper Lane.
Smethwick (NEAR BIRMINGHAM).—Additions to the Empire Garage, Saint Paul's Road, for Brown & Co. (£6,000); Wm. Wilkinson & Son, builders, Hutton Road, Handsworth, Birmingham.
Southgate.—Houses (24), Bush Hill; G. W. Newman.
Southport.—Technical college (£37,240); J. A. Milestone & Son, Ltd., builders, Wallasey.
Stafford.—Rebuilding Guildhall, with council chamber and court house (£18,000); borough surveyor.
Staffordshire.—School (200 places), Stone; F. A. Hughes, director of education, Stafford.
Staines.—Houses (200), Worple Road; A. Black, architect, Osterley.
Stamford.—School (£11,613); R. J. Jellings, Ltd.
Stockton-on-Tees.—Houses (1,000) and municipal buildings (£42,000); borough engineer.
Stourbridge.—School centre, Podmore Road; A. Vernon Rowe, architect.
Sunbury-on-Thames.—British legion headquarters (£2,250); Capt. B. Royce, architect, Slough.
Surrey.—School (744 places), Stoneleigh Estate, Epsom, for County E.C.; F. Mee, deputy secretary, Kingston-on-Thames.
Swindon.—Houses (40), Stratton, and shops and flats, for E. W. Beard, Victoria Road.
Teddington.—Extensions, R.C. church, Kingston Road; Rev. Father Foley.
Wallsend-on-Tyne.—Houses (96), near Bewicke School; Ball and Thomas, builders, Stockton-on-Tees.
Wembley.—Extension, hospital, for Board of Management (£4,000); H. Kenchington, architect, 7, Staple Inn, W.C.1.
West Sussex.—Children's cottage homes; senior girls' school, Southwick; infants' school, Fishergate; senior boys' school, Shoreham; and extensions, poor law institution (£15,000), Midhurst; county architect, Chichester.
Whittlesey.—Alterations to cinema; C. S. Hart.
Wolverhampton.—Rebuilding premises, 10, Dudley Street, for Prices, Tailors, Ltd. (£10,000); S. B. Nicholson, architect, Vicar Lane.
Workington.—Houses (43), Frostoms Estate (£13,500); borough engineer and trade contractors.